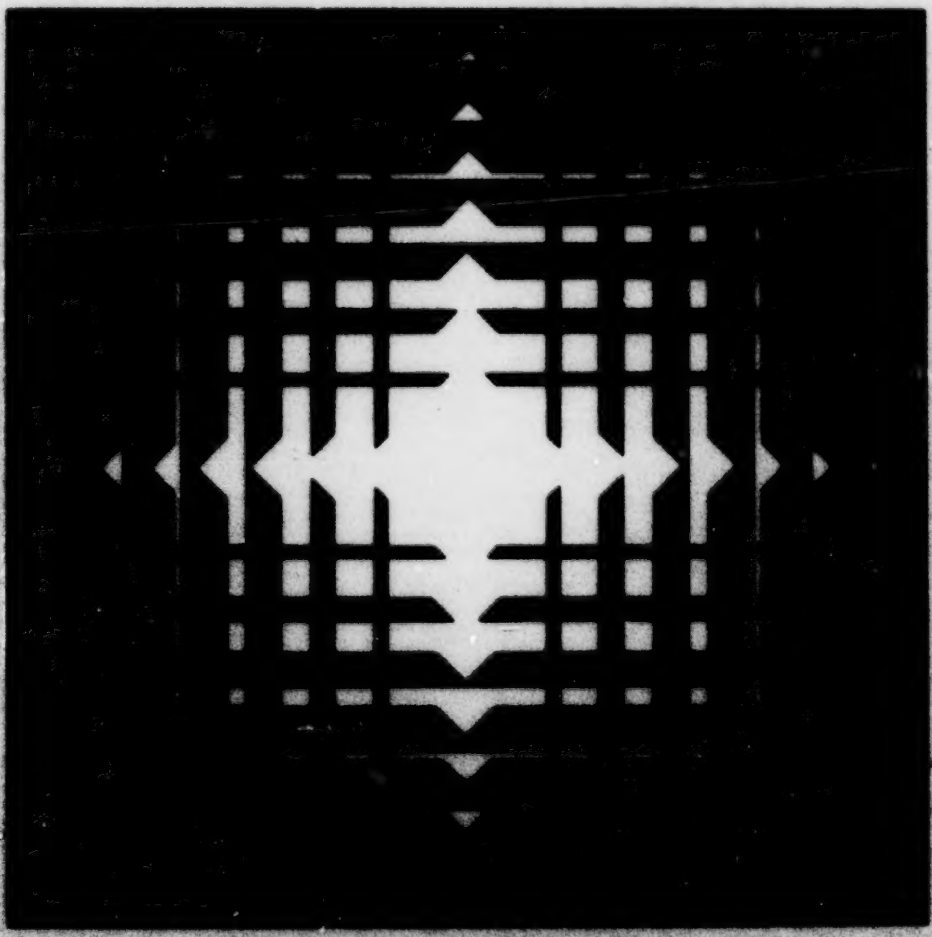
G.F. MATHEWSON
WITH JOHN TODD

Information, Entry, and Regulation in Markets for Life Insurance

ONTARIO ECONOMIC COUNCIL RESEARCH STUDIES



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G.F. Mathewson
with the collaboration of John Todd

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Preface

The analysis is organized in two major parts. Part One, containing a model of the production and sale of life insurance, uses the available data on life insurance prices and firms to test the conduct and performance of this industry and analyse specific policy alternatives for this market. Part Two is a more general description of the features of life insurance and a summary of the market forces at work in the performance of this industry. In this part, written jointly with John Todd, the policy evaluation extends beyond the narrow limits in Part One.

This material, prepared under a grant from the Ontario Economic Council in 1978-9, has undergone successive revisions to its present form. Along the way, helpful comments were received from seminars at the 1980 Canadian Economics Association Meetings in Montreal, Carleton University, McMaster University, Queen's University, and the University of Toronto. In particular, I am indebted for insightful suggestions to Jeffrey Bernstein, Jack Carr, Michael Denny, Mel Fuss, Greg Jump, Yehuda Kotowitz, Herb Mohring, David Quirin, Michael Spence, Michael Trebilcock, Ralph Winter, and the anonymous referees of the Ontario Economic Council. Special thanks are due to Aron Gampel and Sam Kellner for research assistance. The Office of the Superintendent of Insurance for the Province of Ontario was especially helpful in obtaining required institutional and regulatory material.

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PART ONE: ECONOMIC ANALYSIS

1
Introduction

Many people believe that prospective purchasers of life insurance are in a vulnerable market position. It is said that consumers know very little about the characteristics and value of alternative life insurance schemes, while the market fails to discipline life insurance firms and their agents to make known the relative merits of competing life insurance plans. Unsuspecting consumers operating under excessive misperceptions are thus induced to buy inferior products at high prices.

Life insurance products are alleged to be inferior in several dimensions. First, in recent history the savings components associated with permanent insurance have yielded low and possibly negative real rates of return. Second, consumers have been induced to buy insurance contracts with such savings components and only modest life insurance coverage when their interests would have been better served by contracts with no savings elements but increased coverage. Finally, consumers have been induced to buy riders and options such as double indemnity, waiver of premium benefit, and guaranteed insurability at prices above their true value to them.[1]

This study discusses a number of *economic* questions about the performance of markets for life insurance products:

- What explains the distribution of prices for individual life insurance contracts?
- Is consumer ignorance about life insurance products excessive or does the market provide the socially optimal amount of consumer information?

1 It is not our intention to provide a shoppers' guide to life insurance products. A description of insurance contract options and riders may be found in either Consumers Union (1977) or Blunn (1978).

- Do life insurance firms supply the socially optimal amount of sales effort for the product?
- Is the publication of consumer shopping guides on life insurance prices an effective informational device?
- What relationship exists between entry into the market for life insurance products, profitability of life insurance firms, competition in the industry, and any consumer misperception of the value of products produced by the industry?
- Does size and product line diversity confer any special advantages on life insurance firms?
- What is the appropriate policy response to the welfare issues that arise in this industry?

The plan in this study is to present some descriptive detail on the industry and an outline of the relevant previous studies at the outset. Chapter 4 then tackles the natural monopoly and profitability issues. The discussion recognizes the multi-product nature of firms in the industry where firms may supply insurance contracts and annuity contracts to both single consumers and groups of consumers. We test for the presence of economies of scale and diversity of product lines by estimating directly the relations that define the optimal outputs for each firm. No natural monopoly effects are indicated, a result at odds with the empirical research of others but consistent with the institutional history of the industry. Further, the production parameter estimates are consistent with the hypothesis of zero economic profits in this industry, an industry equilibrium. Consequently any entry into this industry is a response to growing consumer demand rather than a competitive response to perceived excessive profits amongst existing firms.

It is well known that zero economic profits do not necessarily guarantee a socially optimal allocation of resources. Additional negative welfare effects appear in the presence of persistent consumer misperceptions on the true value of any industry's output. Life insurance is a candidate industry for such misperception.

The remainder of the study refines and extends the analysis of the effects of consumer ignorance of life insurance on trade between individual consumers of life insurance and life insurance agents representing individual life insurance companies, the dominant form of the agency relationship in Canada. The goal is to explain the observed levels and variability of prices of individual life insurance contracts.

What economic characteristics of individual life insurance purchases differentiate this market from other markets as a candidate for consumer misperception? Individual life insurance is typically either term insurance – insurance of

some specified amount renewable over a relatively short horizon, such as annually or every five years – or permanent insurance of some specified amount where there is an annual premium but the horizon for the contract is longer and the contract has savings or business investment (participating) components to it. There are several optional contract riders such as guaranteed insurability, waiver of premium benefit, double indemnity, and disability income, but these riders usually are restricted to permanent insurance. There are other forms of insurance contracts, but the focus here is on these principal types.

The belief in excessive consumer ignorance is grounded in three observations. First, many life insurance schemes are complex and involve choice under uncertainty; for example, savings, business investment, and life insurance may be tied together in one package with one price where it is difficult to determine the price or expected return and risk on each component. Contract options require consumer decisions under complex uncertainty. For example, guaranteed insurability requires consumers to decide at the time of purchase whether they may wish to purchase additional coverage at some future date conditional upon ill health at that future date which would otherwise render them an excessive medical risk and prevent the underwriting of this additional coverage except at prohibitive rates. Psychological experiments by Kahneman and Tversky (1974) and others show that, in situations of uncertainty, individuals reach different decisions on the basis of the same objective information when the information is presented in a different sequence.

Second, the commissions of life insurance 'agents' are tied directly to the profitability of the contract to the life insurance company and not in any way to the subsequent satisfaction of the consumer; the agents are agents of the companies and not of the consumer. Given the complexity of the life insurance contracts and the choices among policies, it is reasonable to expect that it is expensive to verify the characteristics of the product before purchase. Therefore, there is an increased probability of a substantial divergence between pre-purchase expectations and later satisfaction.

Finally, any 'test' of the product is likely to occur only after a considerable period of time from the date of purchase. Therefore any consumer learning is likely to be protracted. Any product switching for permanent insurance is likely to be costly because of the fixed sales costs (selling and other policy set-up costs) deducted from the early premiums paid by consumers (front-end loading).

Whether any consumer ignorance is excessive or not depends on the degree of the market response to any potential gains from trade from collecting and marketing information in life insurance products. If there are potential gains from trade in this information, why does the market not fill the breach? We might expect firms specializing in information to emerge that could generate and sell the

information and appropriate the socially correct return. There are certainly other markets where such agents have emerged (such as commodity and stock brokers). This is unlikely to happen for at least two reasons. First, information produced by intermediaries has a public good characteristics – the agent who incurred the costs to generate the information cannot prevent its resale and therefore does not appropriate fully the return from the information. Secondly, these independent agents have the same problem in signalling their quality that plagues the life insurance companies. Without their own research, consumers may not be able to differentiate good information from bad.

In Canada life insurance agents usually sell exclusively for one company; the right to exclusive agency by each life insurance firm is protected by law in Canada.[2] Agent mobility among companies is reduced by non-vestiture of residual commissions, so that agents who switch companies lose any commissions on old business. Such arrangements may discourage agents from recommending life insurance contracts that yield the same present value of commissions but postpone the actual receipt of commissions into the future. In general, arrangements that impede agent mobility guarantee that any quasi-rents that might exist from agents' promoting one type of policy and at least some of the rents that stem from differences in abilities between agents accrue to the life insurance firms rather than to the agents themselves. In the presence of any natural monopoly tendencies or other barriers to entry that confer special advantages on large existing firms, any quasi-rents become long-run rents that accrue to these firms.

In general, independent agents may shop more effectively for their clients among the competing suppliers. However, if life insurance products are not accurately evaluated by consumers after being purchased and are not products that are repeatedly purchased by consumers, then independent agents may have no incentive to comparison-shop for their clients. To the extent that consumers do learn after the purchase of the product and are dissatisfied, independent agents may complicate the process. If a consumer is discontent with the policy purchased, there may be confusion about whether the agent or the underwriting company is ultimately responsible.

2 In Ontario, Section 342(1) of the Insurance Act provides that the provincial superintendent of insurance shall, if he is satisfied that the applicant is a suitable person, give that person a licence provided that he has been appointed by a licensed insuror. Section 342(2) of the same Act deals with sponsoring companies. Justice D.H. Carruthers (1974, 38) concludes that 'about the only purpose I can see for there being sponsorship today is to support the principle of single company representation.'

In spite of the asymmetry of information on product design between life insurance firms and their agents on the supply side and individual consumers on the demand side, consumers are not completely passive, lodged forever in their initial state of ignorance. Rather, consumers can engage in self-protection. They do this by spending resources on pre-purchase research into the characteristics of alternative life insurance/savings packages. By doing this, they reduce the probability of being stuck with a bad deal. The magnitude of their investment in information depends on their marginal research costs and anticipated marginal returns. If, as some analysts have argued, the marginal cost of life insurance research is high because of the limited abilities of individual consumers to process information with accuracy, consumers may still be relatively ignorant at the time of purchase. Further, with the possibility of word-of-mouth transmission of such information without payment, such information has a public good characteristic where the original researcher does not appropriate fully the return so that individual consumer production of such information may be too small from a social viewpoint. Each of these features of consumer and firm behaviour needs to be modelled more carefully in the context of equilibrium with entry into the life insurance industry. This is done in subsequent chapters. First, however, we turn our attention to a discussion of the nature of the industry, a critique of the existing literature, and the estimation of production characteristics in this industry.

2
The Canadian life insurance industry

Life insurance companies in Canada may be incorporated either provincially or federally. Since their products can be sold only in the corresponding jurisdictions, most firms are federally incorporated. Data on the operation of each firm are collected by the office of the corresponding superintendent of insurance, which is responsible for the administration of any regulations imposed by law on the companies. The life insurance companies in Canada incorporated federally are used as the sample in this study. The data for life insurance companies appear in two volumes of the annual *Report of the Superintendent of Insurance For Canada:* Volume I, *Abstract of Statements of Insurance Companies in Canada*, and Volume III, *Annual Statements of Life Insurance Companies and Fraternal Benefit Societies*. Most current economic regulation concerns solvency requirements in the form of reserve requirements that must be maintained by companies to guarantee their ability to meet claims and investment constraints on the composition of firm investment portfolios designed to protect policy-holders by guaranteeing that premium resources are not invested in 'excessively risky' investment portfolios. Although the Canadian life insurance industry has not experienced the chequered and colourful past of the U.S. industry, some idea of the reasons for these regulations may be gained by reading the history of the U.S. life insurance industry in the late nineteen century (for example, in Richard Shulman's *The Billion Dollar Bookies*).

Life insurance firms hold large sums of money in trust for their policy-holders. The purpose of solvency regulation is to guarantee that insurance executives maintain investment portfolios of a size and composition compatible with the risk preferences of the consumers of their products. Implicit in this justification for solvency regulation is an argument about informational limitations and asymmetries. The motives and intentions of insurance executives may be hidden from consumers. Therefore, in a world of limited liability where

ownership interest may be small compared to the liabilities to policy-holders, owners of life insurance firms may be tempted to select managers prepared to take 'undue' risks with insurance/annuity deposits. If consumers had perfect foresight, they would avoid such companies.

Mutual insurance companies, in which policy-holders own the company, are one answer to this problem of incompatible incentives between managers of life insurance firms and policy-holders. In Canada in the 1950s there was a trend towards increased mutualization of Canadian firms in the life insurance industry. (Canada Life Assurance Company, Confederation Life Insurance Company, Equitable Life Insurance Company, Manufacturers Life Insurance Company, and Sun Life Assurance Company of Canada are all large firms that began to mutualize in the 1950s.) But mutualization can create another problem. Since ownership is more widely diffused in mutualized companies and ownership rights are not transferable, policy-holders may find it difficult to discipline managers. However, in the absence of any rents that may be dissipated by managers or any differences in the tax treatment accorded joint stock and mutualized firms, and in the presence of competing joint stock companies that pursue profit-maximizing objectives, there should be no observable differences in behaviour between profit-maximizing policies and the actual policies of mutualized firms. Cameron (1981) found no evidence of significant differences in behaviour between joint stock and mutual life insurance companies. In the analysis of life insurance prices reported in Chapter 5 of this study, no difference is found in the pricing behaviour of mutual and joint stock firms. Therefore, this difference in organizational form need not play a large role in our analysis.

While informational asymmetries are implicit in any justification for solvency regulation, the informational issues relate to managerial action. Therefore, solvency regulation does not address the economic issues that surround the current production and distribution of life insurance.[1] Consequently, given our focus on the potential for misperception in the product market and what, if anything, should be done about it, issues of solvency regulation are left aside. On any occasion in this study where investment strategy matters, the solvency issues are recognized explicitly.

1 Whether solvency regulation has in fact reduced risk for consumers of life insurance and what the cost of this regulation is in forgone alternatives are empirical issues. Munch and Smallwood (1980), studying a sample of U.S. property-liability firms, report that solvency regulation in the form of minimum capital requirements has reduced the number of small new firms while other forms of solvency regulation have either ambiguous or no effects. For example, many life insurance firms do not invest up to their allowed limit for various investment categories. This suggests that some solvency constraints have no effect on firm behaviour.

TABLE 1

Concentration ratios in the Canadian life insurance industry (calculated on premium revenue for Canadian-owned and foreign-owned firms)

	Number of firms					
Year	4	8	16	30	Herfindahl index	Total firms
Ordinary insurance policies						
1976	40	59	78	90	0.058	127
1966	42	62	82	93	0.065	102
1956	39	62	85	96	0.060	78
Group insurance policies						
1976	35	57	78	91	0.052	113
1966	39	59	82	94	0.066	97
1956	55	75	92	99	0.133	56
Combined insurance policies						
1976	36	56	76	89	0.051	142
1966	41	61	80	92	0.060	113
1956	40	62	84	95	0.062	81

Tables 1, 2, and 3 describe the life insurance industry over the last twenty years. These tables concentrate on insurance (ordinary and group), not on the annuity side of the business. Table 1 calculates the four-, eight-, sixteen-, and thirty-firm concentration ratios, together with the Herfindahl index for 1956, 1966, and 1976. This index, calculated on the basis of premium revenues for ordinary insurance policies, group insurance policies, and all insurance policies combined, over all life insurance firms operating in Canada (both domestic and foreign firms), indicates a moderately high degree of concentration in both ordinary and group policies but a reduction in concentration in the recent past.[2]

Entry into the industry does not appear to be difficult. From 1956 to 1976, thirteen firms ceased business in Canada; only one of them was Canadian. Over the same period, seventy-six new firms entered the Canadian market, forty of them foreign-owned.

2 In comparison to other Canadian industry concentration ratios, concentration in the life insurance industry does not appear high. For example, in Canadian manufacturing establishments, approximately 25 per cent have a four-firm concentration ratio between 75 and 100 per cent, 25 per cent between 50 and 74 per cent, 32 per cent between 25 and 49 per cent, and 18 per cent up to 24 per cent (see Consumer and Corporate Affairs 1971). Mohring (1959) calculates the following four-firm concentration ratios in the U.S. life insurance industry (percentages, years following in brackets): 51.2 (1900), 46.2 (1910), 41.8 (1920), 45.3 (1930), 48.0 (1940), 45.5 (1950), 43.4 (1954).

TABLE 2

Grossack index and correlation coefficient for changes in concentration in the Canadian life insurance industry, 1956 to 1976

Years	Grossack index	Correlation coefficient (r)
Ordinary insurance policies		
1966 to 1976	0.934	0.981
1956 to 1966	1.021	0.962
Group insurance policies		
1966 to 1976	0.816	0.874
1956 to 1966	0.713	0.911
Combined insurance policies		
1966 to 1976	0.899	0.975
1956 to 1966	0.973	0.973

NOTE: For Grossack index see Grossack (1965).

The change in concentration over the period is most easily analysed by regressing market shares in each period against the respective market shares in the previous period using as a sample all the firms in existence over the period. Regression coefficients, called Grossack indices, are reported in Table 2, together with correlation coefficients. For a sufficiently large sample of firms, the Grossack index approximates the product of the correlation coefficient and the square root of the ratio of the Herfindahl index.

Given the costs to consumers of changing policies (these costs include the direct consumer information costs and any loading costs levied by firms on new consumers), anticipated benefits may have to be large to induce consumers to switch either policies or life insurance firms. Therefore, increased competition in the industry may show up only on new consumers. As a consequence, we distinguish between a stock of ongoing policies and a flow of new policies. Tables 1 and 2 use total premium data and thus include both new and old customers. With this in mind, the interpretation of the results of Table 2 appears to be straightforward. The values of r, the correlation coefficient for the samples, suggest that large firms did not tend to lose market shares to each other. Further, the relative stability of the static concentration ratios for the sale of ordinary policies suggests that large firms did not lose much to small or new firms over the period. For group policies, the large reduction in concentration especially over the period 1956 to 1966 suggests that the large firms as a group lost market share to small or new firms.

Additional information on the relative status of ongoing firms for new business is provided in Table 3. First the annual difference in premium revenues

TABLE 3

Rank correlation coefficients for ongoing life insurance firm's relative annual change in premium revenue by output activity, 1976, 1966, 1956

Years and output activity		Canadian-owned firms	Foreign-owned firms	All firms
1976/1966	Ordinary policies	0.38	0.25	0.35
		(40)	(53)	(93)
1976/1956	Ordinary policies	0.18	0.20	0.30
		(30)	(37)	(67)
1966/1956	Ordinary policies	0.21	0.47	0.29
		(30)	(43)	(73)
1976/1966	Group policies	0.64	–0.12	0.30
		(36)	(54)	(90)
1976/1956	Group policies	0.52	0.16	0.36
		(25)	(26)	(51)
1966/1956	Group policies	0.51	0.33	0.47
		(27)	(27)	(54)
1976/1966	All policies	0.62	0.18	0.44
		(40)	(63)	(103)
1976/1956	All policies	0.58	0.12	0.44
		(30)	(40)	(70)
1966/1956	All policies	0.57	0.44	0.54
		(30)	(46)	(76)

NOTE: Sample size (number of firms) is reported in parentheses under each coefficient; this sample excludes entering and exiting firms.
SOURCE: Report of the Superintendent of Insurance for Canada, Volume III (1976, 1975, 1966, 1965, 1956, 1955)

was calculated for each ongoing firm for 1955-6, 1965-6, 1975-6 and divided by the average increase in premium revenues for that category of policy. This measures the change in each ongoing firm's premiums compared to the average growth in the market. Finally, Table 3 contains the rank correlation coeffients between successive observation periods. These permit us to ask, for example, whether or not ongoing firms that experience large (small) relative net growth in sales volume (a reflection of net new business) in any one period experience large (small) relative net growth in sales volume in another period. Most of these coefficients are positive, which indicates that the relative positions of large and small ongoing firms with respect to new business did not change. In the period 1966 to 1976 there is some negative correlation between growth in net new group business for foreign firms. This picture for the net new business of ongoing firms is the same as the results for the stock of contracts.

TABLE 4

Proportions of insurance premiums and annuity from ordinary and group contracts

	Insurance premiums		Annuity considerations	
Year	Ordinary	Group	Ordinary	Group
1945	93.4	6.6	51.2	48.8
6	93.8	6.2	54.1	45.9
7	93.1	6.9	44.2	55.8
8	92.4	7.6	38.9	61.1
9	91.7	8.3	36.6	63.4
1950	91.1	8.9	35.0	65.0
1	90.8	9.2	23.9	76.1
2	90.0	10.0	28.0	72.0
3	89.0	11.0	25.3	74.7
4	88.6	11.4	25.1	74.9
1955	88.3	11.7	24.8	75.2
6	87.5	12.5	22.1	77.9
7	86.4	13.6	19.6	80.4
8	85.9	14.1	17.8	82.2
9	84.8	15.2	16.2	83.8
1960	84.6	15.4	18.1	81.9
1	84.2	15.8	21.0	79.0
2	83.8	16.2	22.3	77.7
3	83.3	16.7	23.9	76.1
4	82.5	17.5	22.3	77.7
1965	81.4	18.6	22.3	77.7
6	80.0	20.0	25.5	74.5
7	79.0	21.0	27.6	72.4
8	77.9	22.1	28.8	71.2
9	77.0	23.0	32.4	67.6
1970	76.8	23.2	28.2	71.8
1	76.3	23.7	30.2	69.8
2	74.4	25.6	35.0	65.0
3	73.3	26.7	42.5	57.5
4	72.3	27.7	45.6	54.4
1975	71.8	28.2	44.8	55.2
6	70.4	29.6	44.9	55.1

SOURCE: Superintendent of Insurance for Canada (by year)

Finally, Table 4 reports the proportions of total industry life insurance premiums (as well as annuity considerations) accounted for by ordinary and group business. For insurance premiums, there is a monotonically increasing proportion of total revenues from group insurance premiums since 1947. However in 1976, ordinary insurance still accounts for 70.4 per cent of total insurance premiums.

From these results the picture of the Canadian life insurance industry that emerges is one of an industry with a good deal of entry (measured by the number of firms), with large ongoing firms controlling a fairly large portion of the ordinary or individual life insurance business and maintaining their relative position on net new business. In group insurance more change is visible, with group premiums accounting for a larger proportion of total premiums; while on-going firms maintained their relative size position on both net new and continuing business, these firms as a group lost market share to new firms.

Chapter 5 develops a model of consumer uncertainty and search concerning the merits of substitute insurance products and alternative insurance firms. While the test of this model is its ability to explain observed price variability, its central features are consistent with the overall industry picture that emerges here. If any search costs to validate product quality are fixed independent of the number of policies, and if the information on relative product quality obtained through search does not diminish with use, then groups of consumers have an incentive to search more than individual consumers. Further, as group policies are typically term policies with no savings or long-run investment elements, then quality may be more easily validated before purchase for group than ordinary insurance. While this hypothesis does not explain the increase in the proportion of the volumes of premium revenues accounted for by group sales, it is consistent with the 'increasingly competitive' nature of the group business compared to individual business.

The insurance and annuity model of the next chapter is characterized by freedom of entry into the insurance industry (and therefore, zero excess profits) and a long-run equilibrium involving asymmetrical information between firms and consumers which facilitates price discrimination by insurance agents. Tests on the presence of any productive characteristics that yield 'natural monopoly tendencies,' developed and reported in Chapter 4, indicate the presence of *non-increasing* returns to scale in the production and servicing of life insurance contracts but no evidence that life insurance firms that specialize in one or two lines are more efficient than multiple-product firms. All of this is consistent with the industry characteristics revealed in the concentration data.

3
Previous economic analyses of the insurance industry

There is a growing interest on the part of theoretical economists in the nature of equilibrium in insurance markets, reflecting their interest in the behaviour of markets where the economic agents that participate are not equally well-informed. Insurance markets appear to be such markets. Most of this research begins with the postulate that sellers of insurance cannot distinguish between buyers of insurance according to their risk. Therefore, there is nothing to prevent contracts designed for one group (low-risk) being purchased by a second group (high-risk). In order to distinguish themselves from the high-risk group, members of the low-risk group may purchase less insurance, perhaps with a large deductibility (or coinsurance) to signal their lower risk. Therefore, the members of the low-risk group pay a price for their initial possible misidentification with the high-risk individuals. This sorting problem is really the 'adverse selection' problem. The nature of equilibrium contracts in this setting is analysed by Rothschild and Stiglitz (1976), Stiglitz (1977), and Spence (1978). One problem is that a zero-profit (competitive) equilibrium may not exist in this setting. Winter (1979) applies this asymmetrical information specification to cash value insurance policies (whole life or permanent insurance) where the asymmetry concerns the probability of surrender. These probabilities are known by consumers who are assumed to behave rationally, i.e. to maximize expected utility. Amongst other things, Winter demonstrates that in this setting a regulatory restriction of contracts to actuarially fair cash value guarantees that an equilibrium exists. However, this restricted allocation is Pareto-inferior to the unrestricted equilibrium if the two are distinct and if the unrestricted equilibrium exists, i.e. utilities of some are unambiguously higher in the unrestricted equilibrium and others are no worse off. Therefore, cash value regulation decreases welfare in a competitive market with rational consumers.

While Rothschild and Stiglitz's result holds general theoretical interest and Winter's result holds both general theoretical and industry-specific interest, the

informational asymmetries tested in the model developed below assume the polar opposite of Winter's assumptions. Here, consumers cannot costlessly sort out firms and their products, while firms know consumer characteristics and behave rationally, i.e. maximize expected profits. Problems of general consumer ignorance have filtered into the economics literature at several levels. First, consumer search in job markets has played an important part in the labour market literature for some time. Lippman and McCall (1976) provide a survey of this literature. Spence (1977) considers the problem of consumers' misperceiving the risk of product failure in a competitive (zero profit) market. There, for example, if the consumer's perception of no product failure exceds the probability that the product actually does not fail, then if consumers have diminishing marginal utility, product liability insurance is undersupplied. In other words markets fail. The idea that consumers know less than the producers of the good about the product's characteristics is at the heart of the treatment of persuasive advertising by Kotowitz and Mathewson (1979b). In this setting, consumers learn about products, but at a cost, and advertising has the power to persuade consumers, temporarily at least, of the virtues of a product. It is easy to see the extension of this idea to life insurance. In principle, all products have the potential for this consumer deception. What is different about life insurance? The answer is that life insurance is a product that is not easy to understand; the products are not standardized and few; there is not continuously repeated trial and purchasing, so that learning is either non-existent or extremely protracted; and the sums invested, and therefore the potential losses, may be large over a long period of time. These characteristics of life insurance and their implications for consumer ignorance and cheating are developed more fully in the following chapters.

Which of these two informational asymmetries captures more accurately the true nature of life insurance markets? While the most scientific approach would be the development of a general model with sufficient empirical content to distinguish between informational asymmetries that favour firms and those that favour consumers, we do not proceed in that fashion here. Informational asymmetries in markets for life insurance seem on balance to favour firms against consumers. As we shall see, our analysis of observed life insurance price distributions does not lead us to reject this hypothesis.

Mohring (1959) considers the possibility of price discrimination by life insurance firms, made easier by consumer ignorance. Mohring suggests that price discrimination means lower profit margins on contracts in force for substantial periods of time than on those that terminate early, on basic life insurance contracts than on riders for peripheral benefits, and on policies with large face values, especially term and whole life, than on policies issued in small amounts. Lower profit margins follow from increased consumer price elasticities. The question is why price elasticities vary with the identified product characteristics

to yield the hypothesized profit margins. By studying the pricing practices of firms in the industry, both in 1959 and before then, and through a series of interviews with life insurance corporate executives, Mohring concluded that there was strong evidence of discriminatory pricing practice and mixed evidence of rational profit-maximizing pricing behaviour by life insurance firms.

The third possibility was tested more formally. For a set of policies (whole life, twenty pay life, twenty-year endowment, all policies combined) and selected ages at which these policies were issued (25 years, 35 years, 45 years), Mohring regressed a policy expense cost variable calculated as the present value of premiums less cash values less dividends less marginal selling expenses less state insurance premium taxes (normalized per $1000 of insurance) against a set of policy variables – a tilt index (designed to capture the extent to which whole life policy-holders who cash in their policies for the surrender value lose because they fail to share in surplus deferred beyond the data at which it is earned by the firm), the log of policy size, a dummy variable to account for lumpiness in the size of coverage in any contract, a dummy to measure whether the policy is a participating policy or not, an earnings rate variable – and a set of company variables – the amount of insurance in force (a size variable to measure economies of scale), the growth of company sales, the magnitude of average company sales, and whether the firm sold insurance in New York (to capture special regulations that apply to such firms).

These regressions were run on a selected sample of eighty-four American and Canadian life insurance companies accounting for more than 95 per cent of the insurance in force in the United States on 1 January 1954. The results, especially those relating to pricing behaviour, were mixed. Mohring found that there were economies of scale for firms in the industry (a finding consistent with other more recent cost studies but at odds with the results reported in the next chapter). While there is evidence of dividend scale tipping, which indicates discrimination by firms across policies by policy duration, Mohring found that tilting increases rather than decreases with policy size. This finding was at odds with his hypothesis on price discrimination.

While Mohring's first implication from price discrimination plays no role in our analysis, because of the nature of the available price data which calculate present value prices, his second implication is used to account for differences in the 'quality' of contracts across firms. His third hypothesis is a characteristic of the equilibrium solution to our model. At the heart of this model is the concept of price discrimination. However, to understand the magnitude of and variation in price discrimination, we need to explain variability in prices by variability in consumer ignorance which is exploited by rational profit-maximizing firms. This is the task undertaken in future chapters. It turns out that Mohring's fears that life insurance pricing behaviour may not follow from rational profit-

maximizing behaviour are not consistent with our model or our results. Before we consider the issue of rational price variability, we turn to the issue of natural monopoly (economies of scale and / or scope). The model and empirical results appear later. First, we review briefly the previous empirical work on economies of scale in life insurance.

Houston and Simon (1970) fit cross-section average cost functions for a sample of 237 U.S. life insurance companies authorized to do business in California in 1962. They use as an output measure (size variable) dollars of premium revenue and include in this regression other variables to account for interfirm differences in product mix, lapse ratio, and historical growth. Their central finding is the existence of increasing economies of scale up to $100 million in premium revenues and constant returns to scale beyond this.

Geehan (1977) tests for the presence of scale economies for a cross-section sample of forty-three Canadian-owned life insurance companies. A carefully constructed weighted aggregate of the various outputs (measuring twenty-three activities) of these firms is used. Like Houston and Simon, Geehan estimates an average cost relationship linear in some function of output and several variables (e.g. whether the firm is a mutual or joint stock company, the age of the company) thought to affect average costs. Although average costs fall with the weighted measure of output, the results are not statistically significant. In one further test for economies of scale in head office expense alone, Geehan rejects the null hypothesis of constant returns to scale in favour of economies of scale.

One obvious way to deal with the output of a multi-product firm is to use a vector characterization of output. This facilitates tests on changes in certain elements of the output vector, that is, in the output mix. For example, in the case of life insurance, although there may be no economies from expanding ordinary life insurance activities, there may be economies from expanding ordinary life insurance and annuity activities simultaneously because of cost complementarities between the two activities. In a paper that addresses these issues for the property and liability branch of the insurance industry, Halpern and Mathewson (1975) build a full model of an insurance firm and estimate marginal cost parameters from first-order profit-maximizing conditions that equate marginal revenues and marginal costs in each line of insurance activity. Using simultaneous equation estimation techniques that correct for any simultaneity problems that arise due to the joint determination of outputs and costs, this study finds evidence of some cost complementarities for automobile and fire insurance for mutual insurance companies.

4
Economies of scale and scope in life insurance markets

Is the production of life insurance products characterized by economies of scale or scope? Recent work by economists (Panzar and Willig 1977) emphasizes the importance of product-line diversity by multiproduct firms. The concept of scale economies has traditionally been illustrated using a single-product firm, institutions that are rare in the marketplace. For multiproduct firms, there are questions of whether or not an expansion of all output lines in fixed proportion yields a downward-sloping cost surface (decreasing-ray average cost) and whether or not an expansion of output lines with changing output ratios yields cost-saving advantages (trans-ray convexities or economies of scope).

Decreasing-ray average cost is the multiproduct analogue of scale economies, with the consequent implication for monopoly power depending on the size of the marketplace. Trans-ray convexities (or the lack of them) indicate whether (or not) multiproduct firms can outperform specialized single-product firms. For the life insurance industry, there are four principal lines of activity – sales of life insurance and annuities to either individual consumers (ordinary insurance and ordinary annuities) or groups of consumers (group insurance and group annuities). Previous empirical studies of the industry in Canada and the United States find evidence of economies of scale in at least some aspects of the production of life insurance (Houston and Simon 1970; Geehan 1977). If such economies are large compared to the market, there is a justifiable policy concern for excessive prices and monopoly rents. Whatever their merits, society has at its disposal tried policy tools such as public ownership or regulation to deal with such potential monopolies.

However, the life insurance industry is not necessarily a candidate for natural monopoly classification. Over a substantial period of time the life insurance industry in Canada and the United States has supported a large and growing

number of independent firms of vastly different sizes.[1] Moreover, previous studies have proceeded from incomplete models of the firm and industry that do not deal adequately with the multiproduct nature of the firms in the industry. In the absence of any natural monopoly effects, any public policy efforts designed to regulate profits or increase output would be misdirected. Further, the absence of monopoly rents even where prices are set equal to marginal costs does *not* mean that welfare is maximized in those cases where consumers may misperceive product attributes. Consumer ignorance is the essence of market failure in the life insurance industry, where misperception is most pronounced in the sale of individual insurance contracts. Public policy would be most effective if directed at this problem. Before attempting to model in more detail the nature of the exchange between suppliers and individual demanders of life insurance, we test for any monopoly effects in this industry. The first step is to specify and interpret a complete model of a profit-maximizing life insurance firm. This model is then estimated over the world-wide operations of a set of Canadian-owned life insurance firms in several years (1961, 1966, 1971, and 1976).

Any model that uses cross-sectional data where firms are different sizes must generate an equilibrium distribution of firm size. This circumvents Friedman's (1955) objections to cross-section estimation of firm behaviour that in an industry equilibrium with U-shaped average costs and identical technologies, all firms should be alike. For example, Lucas (1978) proposes a distribution of managerial talent as an explanation of different firm sizes. Here, we generate different firm sizes by assuming a distribution of search costs for consumers and the life insurance firms that segment the retail market, price-discriminate across consumers, and incur varying marketing costs depending on the segment of the retail market they service. This explanation is consistent with the model of negotiated bilateral exchange that is used below to explain price diversity in individual life insurance contracts. I believe this marketing explanation of equilibrium firm size generalizes to other industries characterized by a distribution of product information across consumers where sales are a negotiated bilateral exchange between individual consumers and a firm, such as retail automobile sales. The equilibrium characteristics of such an industry bear a marked similarity to a competitive industry, a point similar to an argument made elsewhere by Demsetz (1959; 1968) and Rosse (1978).

In general, the empirical results indicate that there are no economies of scale (no decreasing-ray average costs) in production, although there are some scope economies (trans-ray convexities). This is consistent with the observation that

1 See the concentration evidence presented in Chapter 2.

there is product-line diversity in surviving life insurance firms as well as continuing entry into the life insurance business. The evidence on the nature of equilibrium for this industry is indirect. Estimates of the cost parameters for this industry, when tested, are consistent with the hypothesis that these profit-maximizing life insurance firms of different sizes earn only a normal rate of return.

The next section of this chapter sets forth a static model of a profit-maximizing life insurance firm. The procedure is to specify and interpret the equilibrium conditions from a single-output firm with differences in its marketing efforts reflecting the different segments of the consumer retail market for life insurance. This model yields an equilibrium distribution of firm size where in equilibrium all life insurance firms are characterized by constant or decreasing returns to scale in the production of contracts. Analogous multioutput profit-maximizing decisions for each firm in each of its activities, together with a specification for the firm's total cost function, are estimated simultaneously. The final sections of the chapter report and interpret the empirical estimates together with other tests and offer summary comments and conclusions.

A MODEL OF A LIFE INSURANCE FIRM AND INDUSTRY

Our model of a life insurance firm and industry is conditional upon six assumptions:

- Independent of their corporate structure (joint stock or mutual), life insurance firms seek to maximize expected profits.
- Consumers of life insurance respond differently to individual sales efforts and advertising; further, firms segment the retail market according to this characteristic and possess price setting power in the sale of each contract.
- Life insurance firms are characterized by two separable technologies, a marketing technology and a production technology.
- The risk of death for each consumer is uncorrelated across consumers; further, all firms completely diversify away any insurance risk by writing a sufficiently large number of contracts, by exchanging risk through a complete and perfect reinsurance market, or both.
- Capital markets for the investment of each firm's investment portfolios are competitive and in equilibrium, in the sense that life insurance firms neither outperform nor underperform other financial intermediaries in the construction of optimal investment portfolios.
- Entry into the life insurance industry is unlimited.

Each of these assumptions deserves some comment. Mutual ownership (firms are mutualized when they purchase their own shares) constitutes a non-transferable form of ownership where ownership is more widely diffused than a joint stock company. Therefore, there appears to be a greater potential than usual for managers in these organizations to pursue non-profit objectives. However, in the absence of any forces that generate rents (e.g. natural monopoly tendencies) that may be dissipated in this fashion, the presence of joint stock firms supplying substitute products to the market should discipline mutual firms to pursue the same profit objective.

The second assumption is that consumers of life insurance differ from each other in a readily identifiable fashion to make possible both directed sales effort by insurance agents and directed advertising by the firm. Further, it is argued that firms have price-setting powers in their negotiations with individual consumers. The basis for this assumption lies in an argument on consumer search and information. Life insurance is a bundle of complex product attributes (death benefits, savings options, dividend options, riders on waiver of premiums, guaranteed insurability). Uninformed consumers are capable of pre-purchase research across both product types and selling agents. As long as consumers have varying levels of knowledge on the value of these substitute products supplied in the marketplace, they will respond differently to both the direct sales effort of agents and advertising by the firm. We assume that firms through their agents are capable of sorting consumers on their knowledge.

Moreover, it pays to offer different sales effort, coverage, and price packages to different consumers. The lack of complete information among consumers means that firms have at least some price-setting powers on individual contract offerings. More knowledge about product alternatives should yield increased price elasticities for individual consumers i.e. reduced price-setting powers for individual sellers. For simplicity we shall assume that each firm services only one segment of the retail market, that is, each firm sells a homogeneous commodity to consumers characterized by a common knowledge of life insurance alternatives and consequently a common price elasticity of demand. With entry into the industry, we would expect each firm in each segment of the market to earn only a normal rate of return.

Separable production and marketing technologies mean that no economies of scope exist between producing and selling insurance and annuity contracts. Given the vertical relation between the activities of producing and then marketing policies, this is a reasonable assumption, and it reduces estimation difficulties.

Uncorrelated insurance risk and complete reinsurance markets mean that all insurance firms, independent of their size, can successfully diversify away any

underwriting risk. Therefore, smaller firms are not at an underwriting disadvantage to larger firms due simply to the size of their insurance operation. This is a reasonable assumption given the existence of active reinsurance markets and the size of most insurance firms.[2] It eases considerably the specification burden in the model because it means that, without loss of generality, we may consider a 'typical' consumer's risk of death within each information class of consumers.

The similar assumption of equal competitive returns on investment portfolios across institutions means that, in equilibrium, there are no special advantages that accrue either to insurance firms as a group or to large insurance firms within the group due to their size and therefore their ability to diversify away investment risk.

We assume that there are no capital market barriers to entry into the industry. Freedom of entry means that firms enter the most profitable segment of the industry until, in equilibrium, expected profits are zero everywhere. Provided the average costs exclusive of the actuarial value of the death benefits are U-shaped, entry will lead to a unique equilibrium firm size for each market segment. The distribution of firm size corresponds to different optimal marketing efforts for each segment of the market. Firms choose an optimal output and marketing package.

Although the empirical investigation below recognizes several potential outputs for each firm, we may assume here that each firm sells a single product, a one-period, non-participating insurance policy. The corresponding single-output firm model is specified and the industry equilibrium described. Later, at the empirical stage, we can permit firms to have multiple outputs and multiple sales efforts corresponding to each output to facilitate tests on the sustainability of product bundles.

'Typical' consumers face a probability of $\Gamma (0 < \Gamma \leq 1)$ that they will die during the period, an event that represents in our model a loss of income for their family. With family utility functions concave in income, consumers purchase life insurance contracts that pay death benefits to their heirs. We define the inverse demand function for death benefits for a consumer of a 'typical' firm as

$$P = P(\mu, Z; \Gamma),$$

2 For example, in 1976 the average Canadian life insurance firm serviced 760000 insurance and annuity contracts. If the probability of collecting on any contract is on average 0.2 and the value of the contract is $25000, then the coefficient of variation for payouts per contract for the average firm is 0.0023, a number which indicates that any underwriting risk is low relative to the expected payout per contract.

where $Z \equiv g(S, A; \beta)$, P is the premium price of insurance per dollar of coverage, μ is the size of the contract (death benefits) ($\partial P / \partial \mu < 0$), Z measures the firm's goodwill ($\partial P / \partial Z > 0$), S is the hours of sales effort by the agent to sell *each* contract ($\partial Z / \partial S > 0$), A measures total dollars of advertising by the firm ($\partial Z / \partial A > 0$), and β is a parameter that reflects the response of each consumer group to advertising and direct sales effort. Consumers are ordered so that higher β's mean an increase in the marginal productivity of both salesmen's efforts and advertising, the direct result of the variable levels of knowledge on product alternatives held by consumers ($\partial^2 Z / \partial S \partial \beta$, $\partial^2 Z / \partial A \partial \beta > 0$). (For analytical convenience, we treat β as a continuous variable.) By assuming that increases in goodwill increase the slope of the demand curve ($\partial^2 P / \partial \mu \partial Z > 0$), we guarantee that increases in goodwill increase the demand elasticity of the individual consumer for a given contract size.[3]

If we define the portion of premium revenues invested in an investment portfolio as λ, the expected rate of return as r, and the opportunity cost per dollar of premium revenue to the policy-holder of this investment portfolio as ρ (ρ depends on the non-diversified riskiness of the investment portfolio and the capital structure of the company), then the expected premium revenue from the sale of one contract may be written as (defined to be net of any reinsurance ceded, given the third assumption) $[P(\mu, Z)(1 + \lambda(r - \rho)) - \Gamma']\mu$. Invoking the fourth assumption on capital markets means that in equilibrium $r = \rho$, so that we may define the solution to the firm's optimal contract size problem for that market segment it chooses to enter as follows:

$$\Phi(Z) \equiv \max_{\mu} [P(\mu, Z; \Gamma') - \Gamma']\mu, \tag{1}$$

where we assume that $\Phi(Z)$ is concave.

Costs incurred by life insurance firms are divided between selling costs and head office production costs. Selling costs consist of advertising costs, previously defined as A, and commissions paid to salesmen. Although salesmen are paid a commission that is a proportion of gross premium revenues, the absence of barriers to entry into the ranks of agents, together with the convenient assumption of a homogenous labour force, means that in equilibrium salesmen earn a competitive wage w.

The output of each firm is the number of policies written and retained (i.e. again net of reinsurance ceded) by each firm and defined as m. This is a sensible

3 This condition is consistent with Nelson's argument that firm goodwill informs consumers of alternative products increasing their price elasticities, and thus increasing the degree of competition (Ferguson 1974, 31-3).

definition of output, because we would expect the non-sales and advertising expenses to vary with physical volume of output independent of the size (death benefits) of each contract. Therefore, the costs of production, assuming the standard cost minimizing selection of inputs, are written as $G(m, w)$, where the inclusion of w serves to remind us that head office production costs depend on factor prices. $G(m, w)/m$ is assumed to exhibit the traditional U-shape. under our assumptions and given (1) and our marketing technology, the expected profit problem for a typical life insurance firm may be written as follows:

$$\underset{m, S, A}{\text{Max}}\ E\pi \equiv m[\xi(S, A; \beta) - wS] - G(m, w) - A, \tag{2}$$

where $\xi(S, A; \beta) \equiv \Phi(g(S, A; \beta))$ and ξ is assumed to be concave.

We proceed to describe an equilibrium in this model. A firm equilibrium is characterized by the usual marginal conditions:

$$m : \xi(S, A; \beta) = G_m + wS, \tag{3}$$

$$N : \xi_S = w, \tag{4}$$

$$A : m\xi_A = 1. \tag{5}$$

Equation (3) tells us that profit-maximizing contract levels occur when marginal revenue from the sale of an additional contract equals marginal head office expenses plus marginal commissions to salesmen to sell that contract. Equation (4) tells us that profit-maximizing sales effort *per contract* occurs where the increase in the value of goodwill from a salesman's efforts just equals the competitive wage rate. Sales agents efforts are on a per-contract basis because there is no word-of-mouth creation of goodwill in this model. Equation (5) tells us that profit-maximizing firms should advertise until the marginal value product of advertising (over all consumers) just equals one dollar (the marginal cost).

An industry equilibrium occurs when

$$E\pi = 0$$

or when

$$\xi(S, A; \beta) = (G + A)/m + wS.$$

In this case, (3) is replaced by the usual result:

$$G_m = (G + A)/m. \tag{6}$$

As (6) holds only when $G_m \geq G/m$, long-run firm sustainability and free entry mean that we *never* expect to observe any economies of scale in the production of life insurance contracts in the long run. This is consistent with the entry observations and concentration measures for the industry. There is the potential for increasing returns in the production of goodwill. Data at our disposal do not afford a test of this possibility. In regulatory regimes such as the United States where life insurance has always been distributed through independent agents (in Canada, regulatory rules have historically constrained life insurance agents to work for only one company), the large number of agencies suggests the absence of any economies of scale in sales distribution.

We shall estimate directly a multiproduct analogue of (3), together with a specification of total head office production costs *conditional* upon optimal levels of advertising and sales effort given by multi-product analogues of (4) and (5). We shall then test the consistency of our estimates with an industry equilibrium. Before turning to this task, however, we can discover the nature of an industry equilibrium distribution of firm size in response to a distribution of consumers, i.e. a distribution of β's across consumers.

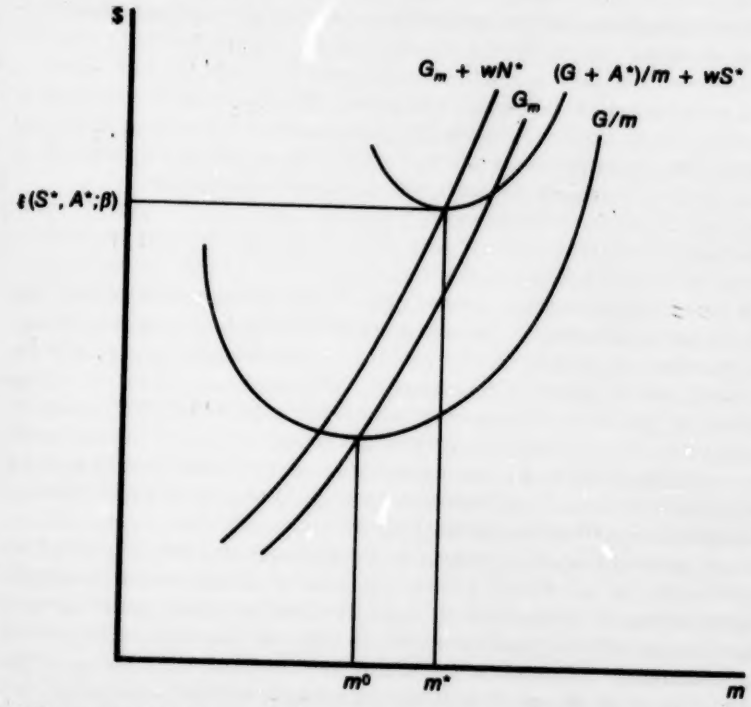
For an industry equilibrium (described by equations 4, 5, and 6), conventional comparative statics under the conditions of this model would show that $\partial m/\partial\beta, \partial A/\partial\beta, \partial S/\partial\beta > 0$. Therefore, this specification yields the prediction that larger firms have larger advertising expenditures and larger sales expenses per contract sold. Figure 1 illustrates the nature of the long-run equilibrium in this industry.

In Figure 1, for consumers of type β^*, who receive S^* hours of direct agent effort per contract and A^* dollars of advertising expenditure, a long-run equilibrium for the firm exists with sales of m^* contracts, that is, (S^*, A^*, m^*) simultaneously satisfy (3), (4), (5), and (6) for consumers of type β^*. m^* is a zero-profit output because the average cost curve with advertising and sales expenditures set at the optimal levels corresponding to m^* is minimized at m^*.[4]

In industry equilibrium the distribution of firms is determined by demand. Corresponding to each value of β will be an industry equilibrium along the corresponding $(G_m + wS)$ marginal cost curve. The number of firms in each segment of the retail market is determined by technological considerations and the density of consumers at any level of β. In principle, these equilibrium conditions are similar to competitive equilibrium conditions. For a firm to exist in any part

4 The nature of an industry equilibrium here is similar to the monopolistically competitive equilibrium described in Demsetz (1959; 1968) and Rosse (1978).

Figure 1
Industry equilibrium for life insurance firms



of the retail market, consumers must be sufficiently dense to support that firm earning a normal rate of return. Starting from a market where consumers are sufficiently knowledgeable that there are no sales expenditures ($\xi_S < w$) and no advertising expenditures ($m\xi_A < 1$) and firm output is illustrated in Figure 1 as m^0, providing consumers are sufficiently dense in number, firm size and goodwill expenditures increase as β increases (for less knowledgeable consumers). Given our specification, larger firms sell larger contracts where the individual consumer's demand elasticity is greater for any given contract size but may not be larger for observed firm equilibrium contract sizes. The reason is that increased goodwill expenditures (in response to higher β's) cause both a shift in the demand for death benefits and a movement along the curve. While the shift increases the price elasticity for a given size of contract, larger contracts reduce

price elasticity.[5] As Figure 1 shows, in industry equilibrium, life insurance firms always produce on that portion of their marginal cost curve G_m that lies above their corresponding average cost curve G/m. Therefore, in industry equilibrium, life insurance firms are *never* characterized by increasing returns to scale in production.

Life insurance firms are in fact multiproduct firms that produce insurance and annuities sold to individuals and groups. This study uses a multiproduct analogue of the profit-maximizing marginal conditions for the firm to estimate directly the production characteristics for life insurance and then tests the consistency of these parameter estimates with an industry equilibrium.

EMPIRICAL ESTIMATION OF THE LIFE INSURANCE FIRM MODEL

The model recognizes four contract types: ordinary life insurance policies written for individual consumers m_1, group life insurance policies written for groups of consumers m_2, ordinary annuities sold to individual consumers m_3, and group annuities sold to groups of consumers m_4. We measure m_2 and m_4 as the total number of individuals in groups serviced by each company each year, thus ignoring any substitution between numbers of groups and group size. Our estimation proceeds directly from the corresponding set of first-order conditions for a multiple-output firm. Conditions corresponding to equations (4) and (5) generate optimal sales effort by salesmen and advertising. While we exclude word-of-mouth goodwill creation across consumers in particular lines for specification convenience, we can permit information spillovers across lines in a multiple-output setting. It is reasonable to expect life insurance firms that accumulate brand names in life insurance products, for example, to be able to trade on that reputation in annuity markets. In this case, our specification for the marketing technology producing goodwill in activity i may be written

$$Z_i = g^i(S, A; \beta), \tag{7}$$

where $S = (S_1, S_2, S_3, S_4)$ and S_i represents the hours of sales effort per contract in line i. Firms then allocate sales effort to each activity to capture not only the

5 An observed demand elasticity may not increase monotonically with firm size because increased goodwill expenditures cause both a shift in the demand curve and a movement along the demand curve. Define $\epsilon \equiv P/(\mu \partial P/\partial \mu)$: $\partial \epsilon/\partial \beta(\mu = \bar{\mu}) = (P\mu P_\mu - PP\mu_\mu)(g_s \partial S/\partial \beta + g_A \partial A/\partial \beta)/(\bar{\mu}(P\mu)^2 < 0$ given our assumptions. While in firm equilibrium, $\epsilon = -P/(P - \Gamma')$, so that $\partial \epsilon/\partial \beta = \Gamma'(P\mu \partial \mu/\partial \beta + P_\mu(g_s \partial S/\partial \beta + g_A \partial A/\partial \beta)/(P - \Gamma')^2$, which has an uncertain sign, as $\partial \mu/\partial \beta$, $\partial S/\partial \beta$, $\partial A/\partial \beta$, $P_\mu > 0$, but $P\mu < 0$.

direct increase in revenue in that line but also the indirect effect of an improvement in the firm's general brand name which increases revenues from other lines of activity.

With the inclusion of these indirect effects, the marginal conditions determining sales effort and advertising, analogous to (4) and (5), become respectively

$$\Sigma_j m_j \xi_{Si}^j = w m_i, \tag{8}$$

$$\Sigma_j m_j \xi_A^j = 1, \tag{9}$$

where $\xi_{Si}^j \equiv \partial \xi^j / \partial S_i$, $\xi_A^j \equiv \partial \xi^j / \partial A$, and ξ^j is the net expected revenue per contract in line j; $i, j = 1, \ldots, 4$.

If we use asterisks to denote optimal solution values for decision variables, then, for these multiple-output firms, the optimal number of contracts by line, conditional upon the optimal production of goodwill, given by (8) and (9), are described by the following:

$$\xi^i(S^*, A^*; \beta) = \partial G / \partial m_i + w S_i^*, \quad i = 1, \ldots, 4, \tag{10}$$

where $G \equiv G(m, w)$, m is a vector of contract outputs, w represents factor prices, and S^* is a vector of optimal sales efforts.

While (8), (9), and (10) are more complex than before because of the multiproduct nature of production and sales, the same general characteristics still prevail for an industry equilibrium.

As (10) is the multiproduct analogue of (3), the economic interpretations are identical. One slight manipulation in (10) is required for empirical purposes. Upon multiplication by $m_i^* / G(m^*, w)$ to yield an elasticity formulation, (10) may be evaluated at the optimal values (m^*, A^*, S^*) as follows:

$$m_i^* \xi^i(S^*, A^*; \beta) / G(m^*, w) = m_i^*(G(m^*, w) \cdot \partial G / \partial m_i + w m_i^* S_i^* / G(m^*, w). \tag{11}$$
$$i = 1, \ldots, 4$$

Equation (11) and the production cost function $G(m^*, w)$ with an appropriate functional form and error specification constitute a system of equations that lends itself to estimation using the multivariate regression technique of 'seemingly unrelated estimation.' Our sample consists of the set of Canadian-owned life insurance firms for the years 1961, 1966, 1971, and 1976. For each of these years the data are taken from the consolidated balance sheets and income statements for the world-wide operations of these firms collected and published by

the federal superintendent of insurance. The sample consists exclusively of Canadian-owned firms because the data available on foreign-owned firms selling in Canada are solely for their Canadian branch plant operations and therefore exclude head office expenses. The data do *not* measure factor prices w for each firm. However, since life insurance firms compete in competitive factor markets, it is reasonable to assume that factor prices are constant across firms in each of our cross-section samples and may be safely ignored. But factor prices do vary through time, if only for reasons of inflation, and such variation cannot be ignored. Consequently, the model is estimated for each of the four years of cross-section data.

A potential problem that arises from the direct estimation of this system of equations is the possibility of simultaneous equation bias due to the endogenous nature of m^* and S^*, variables appearing on the right-hand side of (11) and the total cost function. In this cross-section sample, there are no exogenous final demand or factor supply variables available to facilitate any simultaneous equation methodology to avoid any potential simultaneous equation bias.[6]

Each variable in the model has a measured counterpart in the data. Expected net premium revenues, i.e. total premium revenues net of expected payouts and reinsurance, are required on the left-hand side of (11). The multioutput analogues to the firms' optimal death benefits problem of contract size (given by equation 11 for the single-output firm) yield by definition:

$$m_i^* \xi^i(S^*, A^*; \beta) \equiv m_i^*[P^i(\mu_i^*, Z_i^*; \Gamma) - \Gamma_i]\mu_i^*, \tag{12}$$

where $Z^* \equiv g(S^*, A^*; \beta)$.

Total premium revenues by line net of reinsurance ceded ($m_i^* P^i(\mu_i^*, Z_i^*)\mu_i^*$) are directly measurable. Associated expected payouts ($m_i^* \Gamma^i \mu_i^*$) are estimated as the difference between policy reserve liabilities in each sample year from the previous year.[7]

6 In a simultaneous equation model of property-liability insurance firms, Halpern and Mathewson (1975) were able to construct firm-specific exogenous demographic variables to facilitate a two-stage estimation procedure. Such a procedure was possible because of information on the geographical distribution of firm sales. No information is available on the distribution of the sales of the life insurance firms in this sample.

7 The accounting procedures used in the Canadian industry are described in Canadian Institute of Chartered Accountants (1973, 102-14). Policy reserve liabilities record the present value of anticipated future claims minus the present value of future net premiums. The choice of mortality tables and discount rates obviously affects these calculations. Both mortality tables and interest rates are prescribed by law.

All agent-related expenses (commissions, agent convention expenses, agent pension contributions, etc.) are aggregated to provide estimates of $wm_i^* S_i^*$ for each line of activity. G^* includes all other head office expenses except advertising.[8] To the extent that these measurements reflect arbitrary accounting conventions, such as the calculation of depreciation on fixed assets, such accounting expenses incorporate measurement bias. There is every reason to believe that such bias is minimized in these cost figures.

Most life insurance expenses reflect arm's-length transactions through market determined prices. The principal fixed asset for life insurance firms is their head office building. For the regulatory accounting statements, life insurance firms are required to impute a rental rate to their use of head office space equal to either the rental rate charged to other firms renting space in these buildings or the rental rate for equivalent commercial space in neighbouring sites. Therefore, G^* is relatively free of the usual accounting biases due to arbitrary depreciation rules.

Not all firms in our sample produce in all four lines. Therefore, we must select a functional form of $G(m^*, w)$ which permits outputs to be zero by some firms in some lines. For any study of economies of scope, inclusion of such firms is important. We use a translog approximation to our cost function with a Box-Cox metric on the output lines to facilitate zero outputs in some lines by some firms. Consequently, following Caves, Christenson, and Tretheway (1978), under our condition of constant factor prices for all firms in each of cross-section samples, $G(m^*, w)$ may be approximated as

$$\ln G = \alpha_0 + \sum \alpha_i (m_i^{*\lambda} - 1)/\lambda + \tfrac{1}{2}\sum\sum \delta_{ij} ((m^{*\lambda} - 1)/\lambda) \cdot ((m_j^{*\lambda} - 1)/\lambda). \quad (13)$$

Substituting the marginal cost relation corresponding to (13) into (11), the first-order conditions for profit-maximizing contract levels, and into (13) itself, all conditional on optimal levels of sales effort and advertising, yields a five-equation non-linear estimation problem for each of the four sample years amenable to multivariate regression techniques. Here, we use the 'seemingly unrelated' estimation technique which permits symmetry constraints on parameters across equations ($\delta_{ij} = \delta_{ji}$) and captures any mutual correlations on the regression disturbances (and therefore is known to be more efficient than ordinary least squares). Our system of equations is linear conditional on λ. We

8 While optimal advertising expenditures affect the left-hand side of (11), they are not required explicitly for purposes of estimation.

proceed by specifying a set of values for λ, estimating the remainder of the parameters conditional on λ, and selecting those parameter estimates that correspond to that λ which maximizes the log of the likelihood function for the system.

Parameter estimates together with their standard errors are reported in Table 5. While these estimates yield no direct economic interpretation, it is worth noting that the values of λ that maximize the likelihood function are positive.[9] Before we use these parameter estimates to analyse the nature of underlying production in this industry, we may easily test whether or not the underlying structure is Cobb-Douglas, a structure frequently inputed to insurance production (e.g. Cummins and Vanderhei (1979, 713) specify a Cobb-Douglas production function for property-liability insurance). Table 6 reports the results of log likelihood tests where *rejection* of the Cobb-Douglas structure appears possible in all four years. Therefore previous work that imputes a Cobb-Douglas production structure to insurance firms may be incorrect.

Table 7 contains the summary statistics for our tests of the structure of production. Overall scale elasticity may be measured (Panzar and Willig 1977) as $\text{SE} \equiv 1/(\sum \partial \ln G/\partial \ln m_i)$. Point estimates together with estimated standard errors are reported in Table 7 for an 'average' firm, that is, a firm whose output in each line is the average over all firms in the industry. The results for 1966 and 1971 indicate that the hypothesis that scale economies exist for the average firm may be rejected. For 1961 and 1976, substantially weaker statements are possible, with 1976 indicating economies of scale as a point estimate.

Multioutput production requires consideration of the optimal output packages, of economics of scope. Panzar and Willig (1979) show that a sufficient condition for a twice differentiable multiproduct cost function to exhibit economies of scope is that $\partial^2 G/\partial m_i \partial m_j < 0$. In the translog structure, using the Box-Cox transform on output, approximate tests for this condition, identical to those developed by Denny and Fuss (1977), are that $\alpha_i \cdot \alpha_j + \delta_{ij} < 0$, where the data are scaled so that $m_i = 1$ for all i at the point of approximation. This requires division of each output variable by its respective sample mean. Table 7 indicates that there are sufficient conditions to assume the existence of pairwise scope economies between certain lines in certain years, e.g. ordinary insurance and annuities in 1961 and 1966. Other scope economies which we could not test for

9 Positive λ's mean that the transformed variables converge to a finite value as $m_i \to 0$, that is

$$\lim_{m_i \to 0} (m_i^{\lambda} - 1)/\lambda = -1/\lambda.$$

TABLE 5

Estimates of cost-function parameters for a sample of Canadian-owned life insurance firms

Parameter	1961	1966	1971	1976
α_0	0.108*E*+02	0.122*E*+02	0.117*E*+02	0.647*E*+01
	(0.279)	(0.133)	(0.226)	(0.104*E*+01)
α_1	0.252*E*-01	0.445*E*-02	0.301*E*-01	0.595
	(0.754*E*-02)	(0.445*E*-03)	(0.295*E*-02)	(0.968*E*-01)
δ_{11}	0.943*E*-04	-0.177*E*-05	-0.848*E*-04	0.231*E*-02
	(0.130*E*-03)	(0.443*E*-06)	(0.208*E*-04)	(0.344*E*-02)
δ_{12}	-0.583*E*-04	0.171*E*-06	0.269*E*-04	-0.113*E*-01
	(0.682*E*-04)	(0.260*E*-06)	(0.112*E*-04)	(0.444*E*-02)
δ_{13}	-0.914*E*-05	-0.919*E*-06	-0.128*E*-04	0.637*E*-02
	(0.348*E*-04)	(0.358*E*-06)	(0.860*E*-05)	(0.280*E*-02)
δ_{14}	-0.115*E*-03	-0.173*E*-05	-0.463*E*-04	0.397*E*-02
	(0.218*E*-04)	(0.439*E*-06)	(0.616*E*-05)	(0.273*E*-02)
α_2	0.793*E*-02	-0.181*E*-03	-0.208*E*-02	0.175
	(0.526*E*-02)	(0.298*E*-03)	(0.153*E*-02)	(0.531*E*-01)
δ_{22}	0.757*E*-05	0.286*E*-06	0.282*E*-05	0.280*E*-02
	(0.538*E*-04)	(0.226*E*-06)	(0.649*E*-05)	(0.170*E*-02)
δ_{23}	-0.687*E*-04	-0.408*E*-06	-0.298*E*-04	0.114*E*-03
	(0.240*E*-04)	(0.326*E*-06)	(0.482*E*-05)	(0.367*E*-03)
δ_{24}	0.671*E*-05	-0.898*E*-06	-0.319*E*-04	0.631*E*-03
	(0.143*E*-04)	(0.256*E*-06)	(0.931*E*-05)	(0.376*E*-03)
α_3	0.368*E*-02	-0.222*E*-03	-0.445*E*-02	0.214*E*-01
	(0.159*E*-02)	(0.194*E*-03)	(0.987*E*-03)	(0.418*E*-01)
δ_{33}	0.798*E*-03	0.108*E*-04	0.224*E*-03	-0.164*E*-01
	0.508*E*-04)	(0.211*E*-05)	(0.313*E*-04)	(0.018*E*-02)
δ_{34}	-0.188*E*-03	0.281*E*-05	0.540*E*-04	0.846*E*-02
	0.291*E*-04	(0.175*E*-05)	(0.243*E*-04)	(0.832*E*-03)
α_4	0.146*E*-02	-0.107*E*-03	0.654*E*-02	-0.120
	(0.157*E*-02)	(0.246*E*-03)	(0.685*E*-03)	(0.322*E*-01)
δ_{44}	0.384*E*-02	0.974*E*-05	0.210*E*-03	-0.101*E*-02
	(0.566*E*-04)	(0.210*E*-05)	(0.315*E*-04)	(0.414*E*-03)
λ	0.30	0.50	0.35	0.025

NOTE: Standard errors are reported in parentheses under each coefficient estimate.

with our data could arise from production jointness in marketing, i.e. brand-name effects. There are also positive estimates of some cross-partial derivates which indicate that some joint production may be uneconomic, such as ordinary and group annuities in 1971 and ordinary insurance and group annuities in 1976. In the presence of fixed costs, positive cross-partial derivatives of the cost function are necessary but not sufficient for uneconomic multiproduct production. If demands for the products of the industry were truly independent with uneconomic joint production, then specialized firms would drive multiproduction

TABLE 6

Test of the production structure

Year	Structure	Log likelihood	Test Satistic ($-2\ln L_1/L_0$)	D.F.	Critical value (5%)
1976	Joint cost function (maintained hypothesis)	-465.75	-	-	-
1976	Cobb-Douglas	-517.14	102.78	10	20.5
1971	Joint cost function (maintained hypothesis)	-262.29	-	-	-
1971	Cobb-Douglas	-338.33	152.08	10	20.5
1966	Joint cost function (maintained hypothesis)	-172.20	-	-	-
1966	Cobb-Douglas	-202.29	60.18	10	20.5
1961	Joint cost function (maintained hypothesis)	-287.36	-	-	-
1961	Cobb-Douglas	-341.24	107.76	10	20.5

TABLE 7

Estimates of profitability, scale economies, and jointness economies evaluated at the mean for a selected sample of Canadian-owned firms

Parameter	1961	1966	1971	1976
Scale economies (SE)	0.98	0.83	0.83	1.09
	(0.64*E*-01)	(0.37*E*-01)	(0.63*E*-01)	(0.86*E*-01)
Hypothesis	SE≥1	SE≥1	SE≥1	SE≤1
May be rejected with a probability of error of approximately	0.38	less than 0.0005	less than 0.0005	0.22
Pairwise jointness economies[a]				
J_{12}	-0.12	0.85*E*-01	0.19	0.51*E*-01
	(0.18)	(0.14)	(0.14)	(0.51*E*-01)
J_{13}	0.14[illegible]	0.20[illegible]1*	-0.58*E*-02	0.42*E*-01
	(0.26*E*-01)	(0.94*E*-02)	(0.12*E*-01)	(0.27*E*-01)
J_{14}	-0.51*E*-01*	-0.93*E*-01*	-0.70*E*-01*	0.26*E*-01
	(0.13*E*-01)	(0.26*E*-01)	(0.16*E*-01)	(0.10*E*-01)
J_{23}	0.43*E*-01*	-0.17*E*-01	-0.57*E*-01*	0.42*E*-02
	(0.24*E*-01)	(0.15*E*-01)	(0.97*E*-02)	(0.45*E*-02)
J_{24}	0.36*E*-02	-0.72*E*-01*	-0.79*E*-01*	0.36*E*-02
	(0.12*E*-01)	(0.21*E*-01)	(0.23*E*-01)	(0.20*E*-02)
J_{34}	-0.36*E*-01*	0.24*E*-01	0.27*E*-01*	0.14*E*-01
	(0.63*E*-02)	(0.15*E*-01)	(0.12*E*-01)	(0.21*E*-02)

NOTE: Standard errors are reported in parentheses under each coefficient estimate; estimates marked with an asterisk are significantly different from zero at the 5 per cent level two-tailed.

[a] $J_{ij} \equiv \alpha_{ij}/\alpha_i\alpha_j + \delta_{ij}$, where 1 is ordinary insurance, 2 is group insurance, 3 is ordinary annuities, and 4 is group annuities.

firms from the market. This is not necessarily the case when there are some demand interdependencies; for instance, when the goodwill of the firm crosses product lines. Table 7 does not reveal any consistent pattern of scope economies through time for the average firm. But one fact does emerge. By 1976, any significant economies of scope for the average firm had disappeared. We would thus expect new firms, which can be more flexible on the choice of product lines, not to produce in all four lines. Of the twenty-four new foreign and domestic firms that entered the Canadian market between 1971 and 1976, only one entered producing in all four lines, the others producing in fewer. At best, of course, such evidence is very casual. Although our estimates of the sign of $\partial^2 G / \partial m_i \partial m_j$ are for the average firm, there is no guarantee that the cost surface is identical in shape for other feasible output levels. However, it is possible to conduct the test for any output level by the appropriate scaling of output variables.

Our final inquiry is whether or not our firm model is consistent with a zero-profit industry equilibrium. At any moment in time, expected profits for firms in our model may not be zero, because of lags in entry or exit responses by firms, or transitory effects that may be firm-specific (e.g. errors by firms in identifying with accuracy one or more optimal decision margins specified in the model) or industry-specific (e.g. an unanticipated influenza epidemic that dramatically alters mortality experience). There are firms of many sizes in this industry. We have seen that this large size distribution is consistent with an industry equilibrium, because an equilibrium distribution of firm size in our model is conditional upon a distribution of β's. Zero expected profits plus profit-maximization for each firm in the industry yield an estimate of cost elasticity as the multiproduct analogue of (6):

$$\sum_i \partial \ln G / \partial \ln m_i = 1 + A^* / G^* \equiv \tilde{\eta}, \tag{14}$$

where A^* represents advertising expenses and G^* is total production costs measured for each firm.

An alternative estimate of $\sum_i \partial \ln G / \partial \ln m_i$ may be derived from our estimated cost function. We denote this measure as η. To test the consistency of our cost-function parameter estimates with zero profits we test whether the calculated mean of $d \equiv \hat{\eta} - \tilde{\eta}$ is equal to zero. Table 8 reports the t-statistics appropriate for the null hypothesis that $d = 0$. This test reveals that we cannot reject the null hypothesis that our production parameter estimates based on a firm equilibrium are consistent with the industry equilibrium generated by open entry into our model.

TABLE 8

Tests of the consistency of the cost-function parameter estimates with an industry equilibrium

	Test statistic	Critical value (5%)
1961	−0.58	2.0
1966	−0.84	2.0
1971	−1.70	2.0
1976	−0.53	2.0

SUMMARY AND CONCLUSIONS

This chapter builds a model of profit-maximizing life insurance firms in an industry with open entry. Market segmentation based on the response of consumers to firm expenditures on goodwill is sufficient to yield an equilibrium distribution of firm size. Therefore the model is consistent with the observation that life insurance firms continue to be of different sizes. Based on the marginal conditions for profit-maximization, we estimate the production parameters for life insurance firms. There is no evidence of any natural monopoly tendencies in the production of life insurance. While this result is at odds with the empirical results of other authors, it is consistent with the institutional evolution of the industry in the United States and Canada over the past twenty years. We find evidence of some economies of scope at points during the period for some product lines evaluated at the size of an average firm. Scope economies may exist for other product combinations for a firm of a different size and may also exist because of the presence of fixed costs independent of the bundle of products produced. The absence of scope economies does not rule out the existence of multiproduct firms, because a firm can trade on its brand name. Our production parameter estimates are consistent with a zero-profit industry equilibrium. If the industry is always in equilibrium during the sample period, any observed entry is a response to the growth in demand for the product rather than a competitive response to excess profits.

Our results are a strong statement on certain elements of the operation of the competitive marketplace in one industry. If we define respective insurance prices as net premiums (premiums net of expected payouts) in each line, then price appears to equal marginal cost. The market is sufficiently large that there are no advantages to size from any fixed costs. The size of firms in our sample is consistent with zero profits. In this sense, the market works in this industry. However, a market where entry is open and drives returns to a competitive level even with price equal to marginal costs is only part of the story. There is the

important issue of the nature of both the consumer decision mechanism when choosing a life insurance policy and the life insurance firms' marketing strategy that together generate the demand relationships for the products of this industry. Whether life insurance firms use excessive sales or advertising or are disciplined by the market to reveal only truthful information on their products to consumers and whether consumers are underinformed on market alternatives is the subject of the next chapters.

5
A model of bilateral exchange in individual markets

INTRODUCTION

Our evidence to this point does not show any natural monopoly effects in the life insurance industry. However, this is not the end of the story. The model in the previous chapter is predicated on the power of life insurance agents to price-discriminate (charge different consumers different prices for the same coverage and risk) across consumers and offer contracts where the revenues generated from the sale of each contract minus the actuarial costs of each contract (which may be viewed as the price of each contract) just equal the marginal costs, and, in an industry equilibrium, the average costs of each contract. If these prices are defined by demand curves where the consumers are fully informed of the attributes of the product and its substitutes, that is, there are *no* misperceptions, then standard welfare theory indicates that the market allocates resources in an efficient fashion. However, if the demand curves that consumers hold before purchase (labelled *exante* demand curves) are *not* the demand curves that would be generated in a state of full information (labelled *expost* demand curves), then there are welfare distortions with potential market failure.

The sense in which the market fails is that there are unrealized gains from trade in informing consumers of product attributes. Any policy position advocating public expenditures to facilitate the realization of these benefits must first argue convincingly that private markets fail to allocate resources to realize these gains from trade.

Before examining these welfare issues, we shall consider in detail a model of the nature of exchange between life insurance agents and consumers purchasing individual life insurance contracts. The intention is to characterize the equilibrium nature of the price distribution and to generate empirically testable propositions (tested in the next chapter) on the variability of prices across

contract types. Once we have constructed and tested our model of equilibrium price variability, we can turn to an analysis of welfare-improving changes and a discussion of optimal policy. The informational asymmetries that favour producers of life insurance products over consumers are more pronounced in the sale of individual life insurance contracts than either group policies or annuities. The informational argument is that, beginning from an uninformed state, consumers can protect themselves before the purchase of a contract by engaging in optimal search across competiting life insurance firms and research across substitute life insurance contracts. Consequently, groups of consumers who can spread information costs over the members of the group without a reduction in the value of information should be better informed. Consumers who purchase annuities, which are simpler contracts and therefore more easily researched because they do not involve any complex riders or options available on life insurance contracts, should be better informed.

AN EQUILIBRIUM MODEL OF PRICE ON INDIVIDUAL LIFE INSURANCE CONTRACTS

In our specification of the model, informational asymmetries favour the producers of life insurance against the consumers of life insurance. The producers of life insurance are aware of the true value of each of the contracts they offer for sale. However, consumers of life insurance are not locked forever in their initial state of ignorance but are capable of research into the relative merits of alternative life insurance policies and rational search across competing life insurance firms.

Imagine a sequence of consumer decisions. Before negotiating the purchase of a life insurance contract with a sales agent, each consumer engages in research across the competing contracts to select the optimal policy. Policies vary. The simplest is term insurance, which typically provides death coverage for a specified period of time. More complex forms of coverage include savings elements (whole life or cash value insurance) and possibly dividend elements (participating options). Price data are discussed in detail later, but it should be noted that since the price data correct (however imperfectly) the savings and dividend elements to yield the prices of protection for each policy, intertemporal or portfolio effects are not included in the model.

As the result of this research effort, the consumer forms an opinion of the value of each contract type, which is summarized in a scalar index labelled 'policy specific quality' that varies in proportion to the size of the contract (the death benefits). Based on this index, each consumer ranks the alternative policies

and selects that policy which is ranked as the best. Different consumers rank policies differently, so that more than one policy is sold in the market. There is no guarantee that consumers evaluate these competing policies accurately. The formal model thus represents each consumer's evaluation of the chosen policy as the true value plus an error term. This error term is positive or negative respectively if the consumer overvalues or undervalues the contract.

Life insurance contracts are not easily understood by many (or even most) consumers. There is evidence (Kahneman and Tversky 1974; Kunreuther and Slovic 1978) that consumers do not process information accurately or consistently, especially in situations involving uncertainty. If so, the error terms arising from consumer research across contract types may be large. The result is that a consumer may rank alternative policies incorrectly, selecting the wrong policy and purchasing too much or too little coverage depending on whether the contract is overevaluated or underevaluated. This argument rests on consumer misperceptions, which may be large because of the high marginal cost (low productivity) of research for individual consumers.

Would these consumer misperceptions persist in the long run? Consumers misperceptions about products may be corrected from two potential sources. Agents in the private market who are fully informed for a fee may shop for consumers. While there are, for example, estate planners such as lawyers, who offer advice on the magnitude of appropriate insurance coverage, their advice is typically tied to legal services such as the preparation of wills and does not cover the market for information. The provision of such information services will probably not be adequate, for at least two reasons. First, consumers may have as much difficulty sorting good from bad informational agents as they do sorting life insurance contracts. Therefore, there is potential for misperception over such informational agents. Second, the generation of such information has an non-appropriability feature to it. As the information has the same potential value to a secondary user, the original collector of the information cannot prevent its resale and collects no revenues from the subsequent use of the knowledge. Therefore, there will be an underallocation of resources to the generation of such knowledge in the first instance.

The second source of corrective pressure for consumer misperception lies in the ability of the consumer to learn by using the product. However, any pressures from learning by consumers are likely to be greatest for frequently purchased and used products. Learning will probably not be an important source of market discipline for life insurance firms. Life insurance is purchased infrequently. Most of the contingencies covered are not likely to occur until some time in the future, as in the case of guaranteed insurability for a consumer

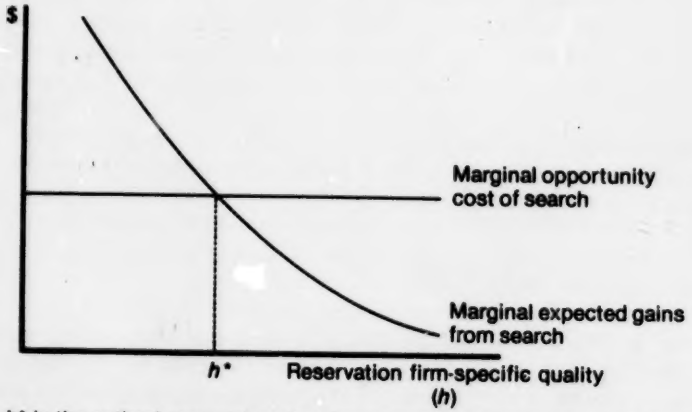
at age 25. There may be significant transactions costs for switching policies because of front-end loading. Consequently, the market cannot be expected to correct consumer misperceptions.

Having selected a policy to purchase, consumers then turn their attention to the selection of an underwriting firm for that policy. For any given contract there can be variability across firms according to, for example, their post-purchase service of the contract, the contingencies covered in their riders and options, their underwriting standards, and their investment performance. Such quality variation is labelled 'firm-specific quality,' and for modelling convenience we assume that such items may be summarized as a firm-specific scalar index that varies linearly with the size of the contract (the death benefits). Consumers are aware of variation across firms in this quality dimension but are uncertain of the location of each firm. However, consumers do know premium prices for each firm. The issue is the level of firm-specific quality represented by each price. In contrast to the misperception argument on 'product-specific quality' where consumers measure with error the characteristics of alternative policies, the search specification for firm quality assumes that consumers can measure accurately quality variation across firms but must spend resources or information to locate each firm. Under the appropriate formulation of the problem (with a sufficiently large set of competing life insurance firms), consumers with strictly positive marginal costs of search never find it worthwhile to search exhaustively over all firms. In order that the distribution of prices does not collapse to a single price, it is important that a large enough group of consumers have zero search costs. This group is therefore fully informed and faces competitive prices.

Consumers specify their willingness to search across life insurance firms by deriving the minimally acceptable level of firm-specific quality. At the optimum, this reservation level of quality is determined as that quality level at which the expected marginal gains from search across competing firms (the likelihood of finding a higher quality beyond the reservation level times the size of the policy) equals the marginal cost of search (Figure 2). This is the standard stopping rule that emerges from the economics literature on job search.

The final ingredient in the consumer decision process is the size of the contract (the coverage or death benefits). We assume that this decision is made *exante*, at the same time as the research and search decisions. This rules out a process of research and search with a subsequent decision on coverage conditional on the outcome of the policy and firm valuations. The rule for coverage states that at the optimal level of death benefits the marginal utility of another dollar of life insurance (which is the probability of death times the marginal value of death benefits plus the expected marginal policy-specific quality plus

Figure 2
Optimal reservation rule for consumer search for firm specific quality for each consumer



h^* is the optimal reservation value for consumer search for firm-specific quality for each consumer.

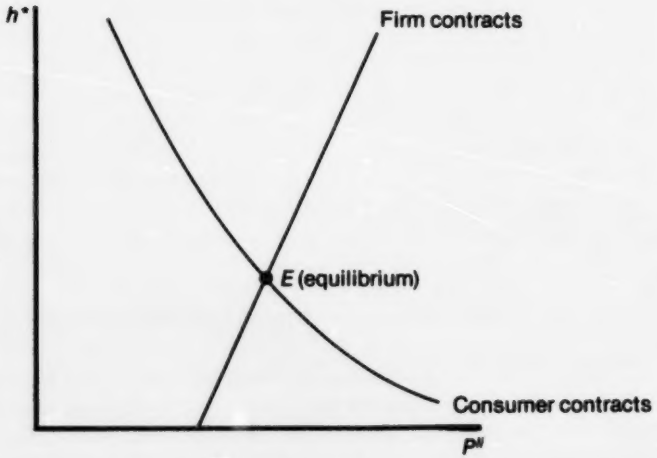
the expected marginal firm-specific quality, both net of research and search costs) just equals the premium price.

Each of these consumer decision margins is altered by variations in the probability of death, the marginal cost of search, the number of firms offering contracts in the relevant class of policies, and the research errors made by each consumer on policy research. It is useful to record the active search role of each consumer through the optimal consumer tradeoff between premium price and reservation firm-specific quality, holding other things constant. This is shown in Figure 3 as a downward-sloping schedule. The lower the premium price, the larger is the size of the contemplated policy and the more scrupulous and demanding is the search policy of the consumer. For each level of death benefits, more search across competing firms makes consumers more price-elastic, that is, it reduces the retailer's power over the consumer's decision. These appealing features are consistent with the argument that increased consumer information about a product should reduce any monopoly power of the seller.[1]

The model is closed with the specification of the behaviour of each life insurance firm and its sales agents. The key to understanding the equilibrium in

1 These arguments are made by Nelson (1970) and Ferguson (1974, 27-53).

Figure 3
Consumer firm price-quality equilibrium for one policy and one segment of the life insurance retail market



Even if the values of contract riders and options, loan contingencies, and any other firm-specific quality attributes are zero, the cost of death benefits alone makes premium price strictly positive, i.e. $P^{II}(h^* = 0) > 0$ for firms.

this industry is market segmentation by life insurance firms and price discrimination across consumers by sales agents of the firms. Life insurance firms are assumed to know the attributes of their products and are capable of differentiating consumers according to not only risk but also, by assumption, the information held by consumers on the relative values of alternative life insurance schemes and underwriters. Therefore, as life insurance sales are on an individual basis where resale is impossible, firms can price-discriminate against consumers. Such price discrimination is accomplished through life insurance agents. We assume that successful agents are capable of reading perfectly the level of information on product quality held by consumers. The result is that the reservation values on product quality formulated by consumers in the definition of their optimal search rules are self-fulfilling.

To focus exclusively on individual life insurance contracts, we consider single-product life insurance firms (unlike the previous chapter) underwriting only individual life insurance contracts. Each firm examines the market for life insurance and enters that segment of the market where the profit potential is largest. Of course, in an industry equilibrium, in the absence of any natural

monopoly effects or other barriers to entry, expected profits for each firm should be zero. Agents for each company examine consumers as they enter the market place *after* their research leading to policy choice, the formulation of their search rule, and the selection of their desired coverage. Each agent sells a set of policies where each policy differentiated by the risk of the consumer is designed to capture consumers with consumer price elasticities of demand, that is, with a common expected firm-specific quality and perception of the value of the chosen policy.

Agents are assumed to play no advisory role, simply a screening role. (We later relax this assumption to permit agents to influence consumer perceptions.) Having selected the relevant subset of consumers, each agent engages in a bilateral exchange with each consumer knowing the latter's perception of the product, reservation level of firm-specific quality, and demand curve for coverage. For each consumer group, profit-maximizing firms select coverage (price being determined by consumers to clear markets) and the number of policies they wish to underwrite. For each policy, the optimal coverage is determined by the rule that the marginal revenue from one more dollar of death benefits equals the actuarial cost of the coverage. This rule generates premium revenues in excess of the actuarial costs of insurance. Firms continue to write policies until the average expected revenue (net of actuarial costs) just equals the marginal costs of underwriting and servicing the policy. In an industry equilibrium, these marginal costs would just equal average costs for each segment of the retail market.

Notice that there is no mention of investment revenue here. We continue to assume, as we did in Chapter 4, that capital markets for the investment of each insurance firm's investment portfolio are perfect and in equilibrium. In this case, expected profits on investment should be zero, so that life insurance firms are just competitive with other financial intermediaries.

From the firm's coverage decision and the definition of the consumer demand relationship, we may define the optimal firm tradeoff between premium price and reservation firm-specific quality, holding other things constant. This is shown in Figure 3 as an upward-sloping schedule. Increases in firm-specific quality shift the expected marginal actuarial costs and demand schedules outward equally. As a consequence, coverage for each consumer remains unchanged, but price increases (by an amount equal to the increase in quality). An equilibrium price and reservation firm-specific quality is defined by the interaction of the consumer and firm schedule in Figure 3.

Changes in the probability of death, the marginal cost of search, the size of any consumer misperception on product quality, and the number of firms underwriting competing contracts (without imposing an industry equilibrium),

cause changes in the equilibrium levels of price and firm-specific quality. These variations in price and the predicted relationship between changes in the exogenous variables of this model constitute the tests for the model in the next chapter. For any given risk class of consumer, variations in equilibrium price are the result of differing levels of search costs and consumer misperceptions. Consumers observe price variability but do *not* know the relationship between search costs, misperceptions, and price levels. Expectations are rational in this model in the sense that the price distributions that underlie the consumer search rules are the observed firm equilibrium price distributions, those prices that firms find consistent with their profit-maximizing objectives. We do *not* impose an industry equilibrium because there is no guarantee that our data points represent zero expected firm profits.

Before attempting an empirical test of this model, it must be recast in formal terms to derive comparative static predictions.

TECHNICAL ASPECTS OF A MODEL OF BILATERAL EXCHANGE IN INDIVIDUAL INSURANCE MARKETS

Consumers in our model are differentiated by the probability of death (risk), the marginal opportunity cost of search, and their subjective evaluation of the alternative life insurance policies available. Within each risk class of consumers, we assume that there is an equal representation of consumers by search costs (which we treat as a continuum where convenient). Without loss of generality but with a considerable reduction in the notational burden, this means that we may focus on the determination of equilibrium prices for a representative risk class of consumers. We impute to each consumer within this typical risk class a specific utility function linear in expected income (to avoid income effects) and the perceived net benefits from holding life insurance policies:

$$EU^j \equiv y + \sum_i \sum_l b^{ilj} \tag{15}$$

where $y \equiv Y - \Gamma L$, Y is the (common) income in the absence of death; Γ is the probability of death for consumers in this risk class; L is the (common) known loss of family income should death occur for the insured; therefore, y is the expected income; b^{ilj} is the perceived expected benefits that accrue to the family (bequest motive) from holding insurance policy type l purchased from company i by consumer j where consumers differ by search costs. All search and purchase decisions are assumed to be *exante* for the consumer. We use perceived net benefits because it is the perception of benefits that influences the decision to purchase. (The notation used in this section is summarized in Table 9.)

TABLE 9

Glossary of variables for a model of bilateral exchange in individual life insurance markets (Listed in order of appearance in the chapter)

Y	consumer income
Γ	probability of death
L	loss in family income from death
b^{ij}	perceived expected benefits from insurance policy type l purchased from company i by consumer j
B^{ij}	perceived expected gross benefits from insurance policy type l purchased from company i by consumer j
μ	death benefits in thousands of dollars
μ_j	consumer j's best estimate of the value of policy-specific quality attributes per dollar of death benefits for policy l measured as the difference between perceived and true value
h_i	value per dollar of death benefits to consumer j from a policy underwritten by firm i
η	iso-elasticity of death benefits in the utility function
P^{ij}	premium price per thousand dollars of death benefits from policy l to consumer j from firm i (measured net of true policy-quality values given normalization in μ_j)
N	number of firms offering contracts in a 'typical' segment of the retail market for individual life insurance contracts
$F(h_i;N)$	distribution of h_i over N firms
n	number of searches for a 'typical' consumer
α_j	opportunity cost per search for consumer j
α_σ^2	variance of α's, assumed identical within each risk class of consumers
u^*	value of u for optimal contract
P^{il}	premium price for consumer j for optimal contract l and firm i
$H(h^*;N) \equiv \int_{h^*}^{\infty}(h_i-h^*)dF(h_i;N)$	
$h^* \equiv \xi(\alpha_j, \Gamma, N, P^{il}, u^*)$.	For values of $(\alpha_j, \Gamma, N, P^{il}, u^*)$, ξ_j measures the optimal reservation value of firms specific quality.
M	number of consumers in a typical risk class
$m \equiv M/N$	number of each firm's underwritten contracts
S	fixed number of hours of (homogeneous) agent's time per contract sold
w	competitive wage rate
λ	portion of premium revenues invested in an investment portfolio by an insurance firm
r	expected rate of return in the investment portfolio
ρ	opportunity cost per dollar of premium revenues to the policy holder from the particular investment portfolio
$G(m, w)$	head office expenses (including agents' commissions)
C	agency and head office setup costs (fixed)
π	firm profits
$\Phi(\alpha_j, u^*)$	maps the joint distribution of α_j, u^* for a given price level, risk category, and number of firms into the distribution of h_i's

The net benefits from the purchase of life insurance are equal to the gross benefits (defined as B^{ij}) less all purchase and search costs. Gross benefits are assumed to be additively separable in three components of the contract. First,

there are the death benefits of the policy, measured in multiple thousands of dollars as μ, that accrue to the heirs on death. The magnitude and circumstances for collection of these death benefits are known with certainty. Expected utility is assumed to be diminishing in these death benefits, and for subsequent empirical purposes it is convenient to assume an iso-elastic evaluation of the face value of the contract.

The final two components reflect the consumer's evaluation of the relative merits of different insurance contract types and the relative merits of competing underwriting life insurance firms. For example, permanent insurance as opposed to term insurance has a savings component which carries a corresponding cash surrender value for the policy that varies in size with the death benefits in the policy. In our static model, the best estimate by consumer j of the value of these policy-specific attributes per dollar of death benefits is represented by a scalar μ_l, 'policy-specific quality.' As the data at our disposal do not afford tests on the nature of consumer research across contract types, we specify u_l as the consumer's best estimate of the value of contract l *after* policy-specific research net of any such research expenses. By an appropriate selection of units of net consumer benefits, u_l is defined as the difference between the perceived and true value of contract l net of research expenses. $u_l > 0$ $(= 0, < 0)$ indicates that consumers overvalue (exactly value, undervalue respectively) these policy specific elements of life insurance choice. We assume that there is a distribution of μ_l's across the fixed set of consumers purchasing individual life insurance.

h_i represents the value per dollar of death benefits to consumer j from a policy underwritten by firm i, 'firm-specific quality.' For example, firms may have different medical criteria for or additional benefits that are included in any guaranteed insurability options or different loan rates where a cash value policy is used as collateral. As well, firms may have varying brand names with respect to past investment successes, service on policies, or dividend policy. Differences such as these in the face of differing marginal costs of consumer search yield differing equilibrium prices to any policy underwritten by different firms. Consumers derive utility from these policy attributes aside from death benefits even if they continue to survive. With this specification, gross insurance benefits in our model net of policy-specific research costs may be written as

$$B^{lj} \equiv \Gamma\mu^{\eta} + (h_i + u_l), \tag{16}$$

where $\eta < 1$ guarantees diminishing marginal utility in the death benefits of the policies.

We impute a simple search procedure to the selection of a firm by each consumer. We assume that consumers do know perfectly the premium price for

each policy underwritten by each firm. Define P^{il} as the price of policy l from firm i to consumer j. The assumption here is that these prices can be separated into two components, one representing the price for a given policy P^l, the other representing a price from firm i for a given policy, i.e. $P^{il} \equiv P^l + P^i$. (Given our selection of units to measure u_l, P^l is net of the true policy-quality values.) Therefore, for each type of contract, consumers know perfectly the respective prices and the distribution of firm quality but do not know without search and scrutiny the location and level of firm quality associated with any price.

In other words, consumers know that there is a distribution of firm-specific quality described by $F(h_i; N)$, where N is the number of firms offering the relevant contract of interest to the consumer. We define η as the number of searches for a typical consumer and α_j as the marginal opportunity cost of search for consumer j. σ_α^2 defines the variance of α, assumed identical within each risk class of consumers. Variability of α across consumers may reflect either varying opportunity costs to search or varying productivity in the search process.

Based on these assumptions and definitions, we may rewrite the expected utility for a typical consumer j in any risk class as

$$\text{EU}^j \equiv y + \sum_i \sum_l [\Gamma \mu^\eta + (h_i + u_l)\mu - \alpha_j \eta - \mu(P^l + P^i)], \tag{17}$$

where EU^j is assumed to be concave. By assumption, consumer j has already carried out any research on the optimal contract to purchase. Therefore, consumers in our model must choose the optimal contract l^*, the appropriate search rule over firms h^*, and the optimal coverage μ^*.[2]

As expected utility is linear in this choice of policy types, consumer j chooses l^* so that $(u_l - P^l)$ is maximized that is, consumer j in this model chooses only one policy. Define u^* as the deviation between perceived and actual policy quality for the chosen contract.

The appropriate search rule is to define a reservation value h^* so that if the consumer encounters a firm whose quality level is $h_i > h^*$, then the consumer buys from firms i. Otherwise, the consumer continues to search. In a similar setting, Lippman and McCall (1976) show that the solution to this standard search problem occurs when the expected marginal benefits from search equal the marginal cost of search for consumer j:

$$\mu H(h^*; N) = \alpha_j, \tag{18}$$

2 Whenever necessary to simplify the mathematics, assumptions of continuity are made.

where $H(h^*;\ N) \equiv \int_{h^*}^{\infty}(h_i - h^*)dF(h_i;\ N)$ is a convex, non-negative, strictly decreasing function with $\partial H / \partial h^* \equiv H_h = f(h^*;\ N) - 1$.

Lippman and McCall show that the expected quality gain from pursuing the optimal search strategy defined by (18) is the reservation search quality. Therefore, the optimal coverage for the best policy evaluated at the expected level of firm-specific quality net of the consumer's search costs is given by

$$\Gamma\eta\mu^{\eta-1} + h^* + u^* = P^{\mu}, \tag{19}$$

where P^{μ} is the premium price per thousand dollars of death benefits for consumer j from the perceived best policy and firm, net of true policy quality values and $\mu < L$ (for reasons of moral hazard). This last constraint is assumed to be non-binding.

Does this specification yield sensible properties for the demand for individual life insurance? From (19), $\partial\mu / \partial h^* = -1 / [\Gamma\eta(\eta - 1)\mu^{\eta-2}] > 0$, so that increased search across firms shifts the consumer's demand function for death benefits to the right, that is, the identification of a better deal increases the desired coverage at a constant price. Further, if we define $\epsilon_{P^{\mu}}$ to measure the price elasticity of coverage, then at a constant level of death benefits $\hat{\mu}$,

$$\partial\epsilon_{P^{\mu}} / \partial h^*|_{\hat{\mu}} = \partial\epsilon_{P^{\mu}} / \partial u^*|_{\hat{\mu}} = 1 / [\Gamma\eta(\eta - 1)\mu^{\eta-2}] < 0.$$

This says that increased search and an increased perception of the policy's quality at a given level of death benefits make consumers more price-elastic. This result is consistent with the view that better informed consumers are more price-elastic consumers.

Solving (18) and (19) for reservation values of firm quality as a function of price and other variables exogenous to the consumer is useful for our subsequent empirical analysis:

$$h^* = \xi_j(\alpha_j,\ \Gamma,\ N,\ P^{\mu},\ u^*), \tag{20}$$

where by conventional comparative static techniques $\partial h^* / \partial P^{\mu} \equiv \xi_{jP} = -H / D < 0$, where $D \equiv \Gamma\eta(\eta - 1)\mu^{\eta-1}H_h - H > 0$ (by virtue of the concavity of the consumer's decision problem).

Therefore, as prices rise and consumers reduce their coverage, they reduce their search efforts. In a similar fashion, $\partial h^* / \partial\Gamma > 0$, $\partial h^* / \partial\alpha_j < 0$, $\partial h^* / \partial u^* > 0$, $\partial h^* / \partial N < ? > 0$. At given prices, consumers facing either a greater risk of death, having a lower marginal opportunity cost of search (a higher marginal product of search), or imputing a larger value to the selected contract en-

gage in greater research. The impact of entry on optimal search is uncertain, as we cannot forecast in general the effect of entry on the distribution of firm-specific quality.[3] These are inutitively reasonable results.

Define M to be the number of consumers in our typical risk class. Then, by assuming that firms servicing each risk class are alike, we may define $m \equiv M/N$ as the number of each firm's underwritten contracts. We assume that agents can discriminate across consumers in each risk class to measure with accuracy the reservation quality every consumer would just accept, h^*. Given the extensive personal financial information solicited in advance of a policy proposal by agents that would facilitate such discrimination, this is a reasonable assumption. In this model, we assume that each life insurance firm underwrites only one level of quality in its contracts. Therefore, firms look across consumers in each risk class and, with open entry, enter that segment of the retail market characterized by consumers with a common evaluation of the policy and a common cost of search, that is, a common reservation value of firm quality.

Firms through their agents face each consumer in a bilateral exchange knowing they face a downward-sloping demand curve for death benefits, and knowing h^*, the consumer's reservation value on firm quality. For convenience, we permit firms to select coverage as a decision variable and use the inverse of the demand function. Therefore, (19) defines the individual demand curve faced by firms in their exchanges with consumers.

Here each sale by an agent requires a fixed number of hours of the agent's time which we define as $\bar{s}$. Although agents are paid a commission that is a portion of gross premium revenues, we assume an equilibrium number of salesmen. Therefore, with open entry into the ranks of life insurance agents and a homogeneous labour force, agents earn a competitive wage rate w.

As well, we assume that capital markets for the investment of each insurance firm's investment portfolio are perfect and in equilibrium. By this we mean that life insurance firms neither outperform nor underperform either each other or other financial intermediaries in the construction of optimal investment portfolios. For example, if λ is the portion of premium revenues invested in an investment portfolio, r is the expected rate of return, and ρ is the opportunity

3 Firms entering (or leaving) any segment of the retail market may alter the optimal search patterns for rational consumers. This may shift the loci of optimal consumer contracts in Figure 3, but the direction of the change is unclear. The uncertainty occurs from the uncertain impact on consumer search equilibrium of general changes in the distribution of offers from firms. For example, with a constant marginal cost of search, entry that shifts the distribution to yield a higher marginal benefit to search at the old equilibrium increases both search and price. This result turns on the sign of $H'' \equiv \int_{h^*}^{\infty} (h - h^*) f_{nnh} dh$, which, in general, is *not* known.

cost per dollar of premium revenue to the policy-holder from the particular investment portfolio (ρ depends on the non-diversified riskiness of the investment portfolio and the capital structure of the company), then, using (19), the expected premium revenue including net investment return for the life insurance firm from the sale of each individual contract is $[\Gamma\eta\mu^{\eta} + \mu(h^* + u^*)][1 + \lambda(r - \rho)]$, identical to our specification in Chapter 4. Invoking our capital market assumption means that $r = \rho$.

Finally, to focus exclusively on individual contract, we consider all costs of life insurance firms to be separable by contract line. Such separability eases the analytics by assuming that there are no economies of scope across product lines (consistent with our early empirical findings for 1976) and contract types, thus avoiding the difficulties in packaging that would emerge from multioutput firms.

We now assemble the cost components. Costs incurred by each firm include expected payout costs equal to expected death benefits and the costs of providing policy and firm quality. We assume that quality marginal costs are constant and equal to one. Policy quality measures have been scaled so that their true measures (costs) are zero; firm quality is the reservation value for consumers in that segment of the retail market serviced by each firm. Therefore, payout costs may be written as $(\Gamma + h^*)\mu m$. Agent expenses are $wm\bar{s}$. We aggregate agent expenses with all other head office expenses as $G(m, w) + C$ where $G', G'' > 0$, $G' > G(m, w)/m$ for all m, and C is a positive constant. It is reasonable to expect that all head office expenses should vary directly with the number of contracts underwritten, the physical volume of output. Fixed costs C arise as the setup costs of establishing a head office and agency system for each policy type sold by each firm. These assumptions guarantee a unique firm size in an insurance industry equilibrium.

Given the exclusivity of choices of policy types by each consumer and our cost specification of each firm with perfect equilibrium capital markets, expected profits for each policy type (type of life insurance, risk category, firm-specific quality) may be considered independently and are defined as

$$E\pi \equiv [\Gamma\eta\mu^{\eta} + \mu(h^* + u^*) - \mu(\Gamma + h^*)]m - G(m, w) - C.$$

Expected profits for each firm are maximized with respect to insurance coverage μ and the number of policies underwritten m. Expected profits are assumed to be concave in these decision variables. A firm equilibrium is given by

$$\Gamma\eta^2\mu^{\eta-1} + u^* = \Gamma, \tag{21}$$

$$\mu[\Gamma(\eta\mu^{\eta-1} - 1) + u^*] = G'. \tag{22}$$

(The assumption that all M consumers buy a policy characterized by strictly positive coverage constrains the distribution of u^* across consumers to guarantee that the left-hand side of (21) and (22) are strictly positive.) An industry equilibrium is characterized by N^* such that $E\pi\ (N = N^*) = 0$.

Equations (21) and (22) are the usual marginal conditions. They deserve some comment. Notice that because of our assumptions that life insurance salesmen measure h^* with accuracy and that the marginal costs of supplying h^* are constant and equal to one, the firm's marginal conditions and therefore its decision variables are independent of h^*. this means that subject only to a sufficient density of consumers to guarantee that $E\pi \geq 0$, life insurance firms are willing to supply any firm quality demanded. More important, this means that in this model, search decisions by consumers across firms do *not* affect the death benefit size of contracts or the number of contracts sold, a strong result.

A second feature that eases the analytical burden is that the ability of the firm to discriminate across consumers means that (21) and the average revenue from the sales of each contract in (20) are independent of firm size m. Therefore, using (19), we may define the optimal premium price per dollar of death benefits corrected for true product quality as

$$P^{\#} = [\Gamma - u^*(1 - \eta)]/\eta + h^*, \tag{23}$$

where $\partial P^{\#}/\partial h^* = 1$ (increases in h^* shift the expected marginal payout cost and demand curves equally, so that μ^* in (21) remains unchanged but price increases), $\partial P^{\#}/\partial\Gamma > 0$, $\partial P^{\#}/\partial u^* < 0$, and $P^{\#} > 0$ requires $\Gamma + \eta h^* > u^*(1 - \eta)$. Increases in risk and declines in policy evaluation increase the premium price because they reduce price elasticity.

Equilibrium levels of premium price and firm-specific quality are determined by the simultaneous satisfaction of (20) and (23), the respective price / quality tradeoffs for consumers and firms. Figure 2 showed such an equilibrium.

The effects of changes in parameters on the equilibrium levels of h^* and $P^{\#}$ are essential for any empirical test. These are summarized as $\partial h^*/\partial\alpha = \partial P^{\#}/\partial\alpha < 0$; $\partial h^*/\partial\Gamma$, $\partial P^{\#}/\partial\Gamma > 0$; $\partial h^*/\partial u^* > 0$; $\partial P^{\#}/\partial u^* <?> 0$; $\partial h^*/\partial N$, $\partial P^{\#}/\partial N <?> 0$. For any given risk category and price level, $h^* \equiv \Phi(\alpha_j, u^*)$. Consequently, the distribution of firm-specific quality levels is determined by the joint distribution of the costs of search and perceived policy evaluations across consumers in any risk category for any given price. These are the quality variations observed by consumers.

6
Consumer information and price variability

DATA

The test of our equilibrium model of informational asymmetries in the life insurance industry is whether or not it is capable of explaining the observed variation in the prices of different life insurance companies for individual life insurance contracts. Specifically, the predictions generated by the model are tested for the effects of changes in the age of the consumer group purchasing the contract, the number of companies underwriting the particular policy, the sex of the consumer group, and a set of variables that capture the characteristics of the policy.

The data available to test the model consist of two samples of life insurance prices from firms serving the Canadian market for two consecutive years (1978 and 1979) and one sample of life insurance prices from firms selling life insurance in New York State for 1977. These data measure the price per thousand dollars of insurance for a set of life insurance companies selling in the respective markets. We assume that each observed price is an equilibrium price between a firm and a class of consumers differentiated by risk and by their willingness to search. Life insurance companies simply segment the market. The observed price is an equilibrium price in the sense that contracts are sold, but there is no assumption that the observed prices represent an industry (zero-profit) equilibrium.

Canadian life insurance companies volunteer price data to the Consumers' Association of Canada. Companies are not compelled to submit their price schedules. These price calculations are fraught with the usual difficulties of constructing the appropriate price index for products of varying characteristics. In this case, the method of price calculation is the 'interest adjusted net cost'

(IANC) method, a standard method of price comparison in the insurance industry. It assumes that consumers of life insurance live with probability one for a fixed period (either ten or twenty years) and then cash in the policy for the cash surrender value with probability one. For term policies and non-participating permanent (whole-life) insurance, the calculations do not involve dividends. For participating policies, dividends are forecast. Finally, all policies are evaluated at the end of the fixed horizon by subtracting from the accumulated premiums the cash surrender value of the policy and the accumulated (forecast) dividends. The result is present-valued as the pure insurance cost. The reported price is the pure insurance cost per thousand dollars of coverage. The interest rate used by the Consumers' Associatoin of Canada is 6 per cent. The method yields a distribution of protection prices (per thousand dollars of insurance) by company by policy types. Undoubtedly, the arbitrary assumptions on life expectancy, horizon, and the likelihood of surrender of some policies introduce some bias, but any systematic statement on its bias does not appear to be possible.[1]

The New York sample of prices is published by the State Insurance Department. For New York, we restrict our attention to ten-year IANC data. The ages at which the sample policies are issued are 20, 35, and 50. Many life insurance companies do not renew term insurance beyond age 65, so that the sample of firms is greatly reduced for twenty-year IANC data.

COMPARATIVE STATICS

We do not have information on the research or income characteristics of consumers of particular life insurance companies. The test of the model of consumer pre-purchase research and misperception takes the form of explaining the relative within-group price variability of individual life insurance contracts (i.e. we examine the relative variability in P^{il} for each contract type l). The model developed in the previous chapter emphasizes the profit-maximizing levels of coverage and numbers of contracts by individual life insurance firms, 'market clearing' quality levels contingent on pre-purchase consumer research and on perfect sorting and price discrimination by life insurance firms. We postulate conditions of open entry into the life insurance industry. In the data at our disposal there is no guarantee that a condition of long-run entry equilibrium

1 For example, discount rates of 6 per cent seem unduly low in a world where inflation exceeds 6 per cent. This may overvalue savings and dividend elements and therefore underprice the cost of insurance elements. Furthermore, forecast dividend policies are based on historical dividends. For these reasons attention is restricted to price variation within types of policies.

prevails. Therefore, the numbers of firms writing in any class of individual life insurance contracts is treated exogenously. Prevailing prices (coverage) and reservation levels of quality are given by consumer decisions on firm search and policy research and by firms' decisions on death benefits. These decisions are independent of the optimal numbers of individual life insurance contracts to be written. Consequently, comparative static predictions on the effect of changes in exogenous variables on prices (coverage) and reservation quality levels may be studied by focusing exclusively on the optimal coverage and optimal reservation quality conditions (described by equations (20) and (23) in Chapter 5 and shown in Figure 3).

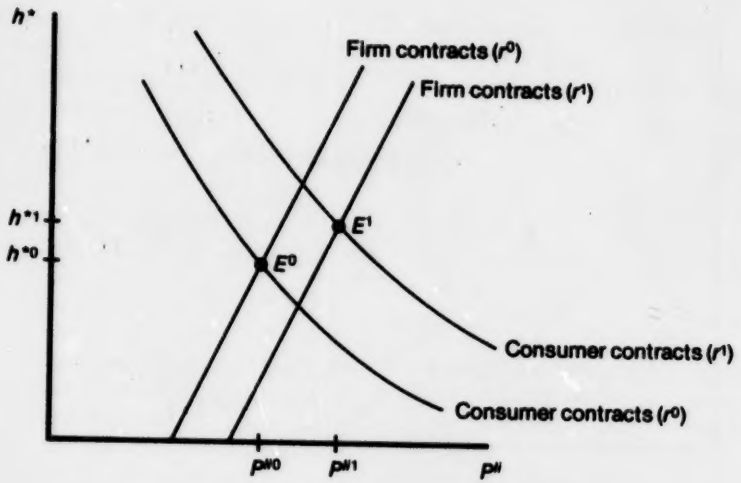
For empirical purposes we may identify three sets of exogenous variables: the probability of death, the number of competing firms, and consumer misperceptions of the quality of alternative policies. While these are summarized at the end of this last chapter, interpretation and understanding are increased by considering in more detail the effects of changes in each of these exogenous variables in the consumer-firm equilibrium shown in Figure 3.

First, what is the effect of a change in the probability of death on the price of protection and realized firm quality? We ignore here any effect that such a change may have on policy research, that is, we assume that there is no change in the policy selected for purchase by the consumer. For consumers, at each price level an increase in the probability of death causes consumers to search more intensively to define a higher reservation level of firm quality. For firms, at each price level an increase in the probability of death causes the actuarial cost of each policy to increase. At the same time the marginal revenue curve faced by the firm rotates outward. The impact is to increase the price charged by the firm for each level of firm specific quality. Figure 4 illustrates this effect. The net impact is to increase both the equilibrium level of price and firm-specific quality.

Second, what is the effect of more sellers on the price of protection and realized firm quality? More firms leaves the price-quality locus for firms unchanged. The effect of more sellers on the consumer's price-quality locus is uncertain because we are uncertain of the impact of more sellers on each consumer's search behaviour. If more firms increases the payoff to search at the existing margin so that more search is undertaken by consumers, more firms increases both equilibrium price and firm-quality levels as consumers demand better quality, which is more expensive for firms that set higher prices.

Finally, what is the effect of increased perceptions of quality for the selected policy on the price of protection and the realized firm quality? For each level of price, increased policy perceptions induce greater consumer search. Therefore, the consumer locus of acceptable firm quality and price shifts to the right. As an

Figure 4

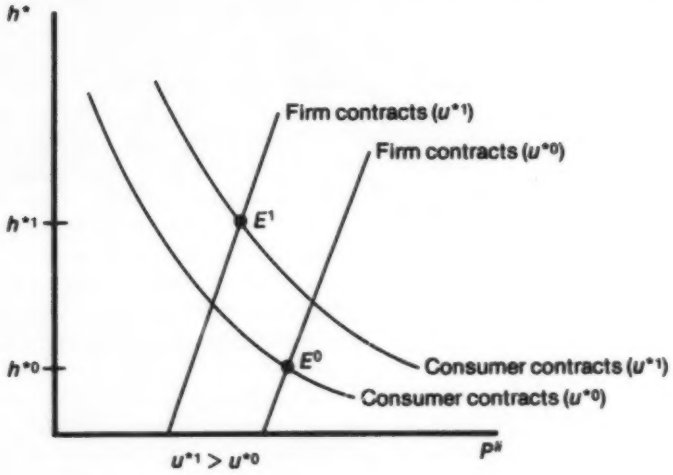


increased perception of contract quality by consumers reduces price elasticity in our model and therefore monopoly power, for each level of firm quality the price of protection falls. Therefore, the firm locus of acceptable firm quality and price shifts to the left. The net result is that the equilibrium level of firm quality increases but the impact of equilibrium price is ambiguous. Figure 5 shows this effect.

These comparative static results constitute the empirically testable propositions of our model, though they cannot be tested directly. We define a class of insurance policies by the exogenous variables – risk class of consumer, policy type, and number of competing firms. Within each class of insurance policies, in our model of negotiated bilateral exchange between agents (firms) and consumers, prices are different because of the variation in the marginal opportunity cost (productivity) of search between consumers. Clearly, this feature needs to be incorporated into our analysis. We proceed to develop an expression that determines the relative price variability within each class of insurance policies as a function of the variability in the marginal search costs of consumers. Variability in this measure of relative price dispersion across contract types stems from the differences that characterize each class of consumers.

In order to develop our empirical tests more precisely, some manipulation of the consumer and firm reaction paths (described by (20) and (23) in Chapter 5) is

Figure 5



required. First, we take logarithms of the firm's price-quality path[2] and linearize the consumer's price-quality path to yield (respectively):

$$\ln P^{ji} = \ln [\Gamma + \eta h^* - u^*(1 - \eta)] - \ln \eta, \tag{24}$$

$$h^* = H_{\alpha}{}^* \alpha_j + h_{\Gamma}{}^* \Gamma + h_N{}^* N + h_u{}^* u^* + h_P{}^* P^{ji}, \tag{25}$$

where $h_{\alpha}{}^* \equiv \partial h^* / \partial \alpha$ and so on.

Within any risk class of consumers and for any one type of policy, our data do not afford measures of the u^* held by individual consumers. For empirical purposes we assume that u^* does not vary within a risk class for a policy type. We do account for variation in u^* across policy types. Within any risk class of consumers for a specific policy type, variation in prices set by firms in our model occurs only because of variation in α_j, the marginal opportunity cost of search. Therefore, under conditions, for each type of contract, (24) and (25) become

$$d \ln P^{ji} \equiv dP^j / P^{ji} = \eta dh^* / [\Gamma + \eta h^* - u^*(1 - \eta)], \tag{26}$$

2 Taking logarithms permits us to evaluate relative price variability. The virtue of relative price variability is that this measure is affected directly by consumer insurance risk, number of insurance firms, and policy attributes through their effect on price levels.

$$dh^* = h_\alpha{}^* d\alpha + h^*_{h,P} d \ln P^k, \tag{27}$$

where $d \ln P^k \equiv dP^i / P^k$ because P^i is fixed for each class of contract and $h_P{}^* dP^k \equiv h^*_{h,P} \cdot \partial \ln P^k / \partial P \cdot dP^k / d \ln P^k \equiv h^*_{h,P} d \ln P^k$.

Substituting (27) into (28), solving for $d \ln P^k$, and squaring both sides permits us to write

$$[d \ln P^k]^2 = C[d\alpha_j]^2, \tag{28}$$

where $C \equiv [\eta h_\alpha{}^* / (\Gamma + \eta h^* - u^*(1-\eta) - \eta h^*_{h,P})]^2$.

Equation (28) may be reinterpreted with an error term as

$$\sigma^2_{h,P} \simeq C\sigma_\alpha{}^2 + \epsilon_P. \tag{29}$$

Equation (29) tells us that, given our specification, the relative price variability within given policy types is a linear function of the variance in the marginal opportunity cost (marginal productivity) of consumer search across firm-specific quality. The greater this variance, the larger is the relative price variability for a particular policy, holding constant the number of firms and the probability of death. However, as these variables change including policy characteristics, they change C in a highly non-linear fashion. While we do not have sufficient information to measure C as it stands, we may proceed to test our model by linearizing C over the variables (Γ, N, u^*) that are measured in the data at our disposal on individual life insurance contracts. A linearization of C yields

$$C \simeq C^\circ + C_\Gamma \Gamma + C_N N + C_u u^*. \tag{30}$$

Substitution of (30) into (29) yields

$$\sigma^2_{h,P} \simeq \sigma_\alpha{}^2 C^\circ + \sigma_\alpha{}^2 C_\Gamma \Gamma + \sigma_\alpha{}^2 C_N N + \sigma_\alpha{}^2 C_u u^* + \epsilon_P. \tag{31}$$

Inspection of (17) reveals that under the assumption of a constant $\sigma_\alpha{}^2$ within each policy type of risk class, linearization has the virtue of facilitating tests on the model if the equilibrium predictions are capable of predicting unique signs for C_Γ, C_u, and C°. For the equilibrium consumer-firm model developed here, $C_\Gamma < 0$, because $\partial h^* / \partial \Gamma > 0$ from the consumer-firm equilibrium[3]; $C_N < ? > 0$, because sign C_N = –sign H_N, and the sign of H_N cannot be

3 For example, $C_\Gamma = -2[\eta h_\alpha{}^*]^2[1 + \eta h_\Gamma{}^*]/[\Gamma + \eta h^* - u^*(1-\eta) - h^*_{h,P}]^3$. Since $h^*_{h,P} < 0$, $I^k > 0$ (i.e. $\Gamma + \eta h^* > u^*(1-\eta)$), and $h^* > 0$, we may predict that $C_\Gamma > 0$.

predicted uniquely from the consumer-firm equilibrium; $C_u < ? > 0$, because sign C_u = –sign $\partial P^j / \partial u^*$, and the sign of C_u cannot be predicted uniquely from the consumer-firm equilibrium. In the absence of firm and policy-quality differentials and consumer search, $C_\Gamma = C_N = C_u = 0$ (the null hypotheses).[4]

Our price data do not include any information on the consumers purchasing insurance contracts. Therefore, in our specification the consumer choice model leaves insurance demand independent of income. However, life insurance seems to be a normal good, so that we can correct for the omission of incomes by calculating relative price variability for groups defined not only by risk and policy type but by the size of death benefits as well.

The measured characteristics of life insurance policy and their predicted effects are as follows:

Age. Age is a measure of the probability of death. Therefore, based on our model, age should have a negative coefficient.

Number of companies writing the policies. For the Canadian data not all the companies underwriting the various policies in the Canadian market voluntarily report their prices to the Consumers' Association of Canada. As long as the sample of included companies is unbiased, however, there is no problem. The sign of C_N depends on the negative of the sign of $\partial h^* / \partial N$, which in the consumer-firm equilibrium depends on the sign of H_N. If C_N is positive (negative), then 'on average' the existence of more sellers reduces (increases) the marginal benefit from search.

The next set of policy characteristics are measured by dummy variables. They do *not* measure the sign of absolute magnitude of u^*, the value imputed to policy-specific quality items, but they do measure the relative values of u^*, that is, they measure whether u^*'s held for one type of policy are higher or lower than u^*'s held from some reference type of policy. The discussion that follows assumes that $\partial P^j / \partial u^* > 0$ (i.e. increased perceived policy quality increases price) and therefore, that $C_u < 0$.

Sex (relevant where policies are underwritten for both men and women). Sex differences are measured by a variable set equal to 0 if female, 1 if male. We cannot predict whether men or women systematically overvalue or undervalue

4 If logs were not used, the estimating equation would become

$$\sigma_P{}^2 \simeq C_u{}^2 + \varepsilon_P,$$

where $C \equiv [h_u{}^* / (1 - h_P{}^*)]^2$. Given our linearization, C is independent of $[\Gamma, N, u^*]$.

life insurance. The decision for women to buy insurance may or may not be made independently of insurance decisions made by a husband, if one exists. If women overvalue policies relative to men, perhaps through inexperience, or if men purchasing insurance for their wife overvalue it compared to their own, then $C_w < 0$. Some firms have prices for women set equal to the prices for younger men because of a lower risk of death for any one age group. Therefore, this sex variable may pick up a risk or an age effect.

Type of insurance. Insurance policies are typically either term, permanent non-participating, or permanent participating. The three-way characterization of relative over- or undervaluation of policy types requires two dummy variables, one variable equal to one for permanent insurance (zero otherwise) and the other equal to one for participating permanent insurance (zero otherwise). Conventional opinion on the insurance industry suggests that consumers overvalue permanent insurance compared to term insurance.[5] Permanent insurance is considered an inferior commodity because of the low (negative real) rate of return on the savings component. If so, then the coefficient on the first dummy variable should be negative. Conventional opinion on the insurance industry suggests also that in times of falling moralities and growth in the demand for insurance, participating policies are better deals than nonparticipating policies for permanent insurance.[6] If participating insurance is undervalued relative to non-participating insurance, the coefficient on the second dummy variable should be positive. The sum of these two coefficients indicates whether permanent participating insurance is under- or overvalued compared to term insurance. There is no prediction on this magnitude by industry commentators.

Table 10 reports the estimated coefficient for the model. In general, *F*-statistics for each regression (not reported in Table 10) suggest that we may reject the no-search null hypothesis. An increase in age or risk of death stimulates search, which reduces price variability in all samples. More firms increase relative price dispersion. In those samples which include policies underwritten for both men and women, women face greater relative price dispersion than men. The variable to measure relative rankings of term and permanent insurance is significant only for the 1978 Canadian sample. The results for the other samples suggest that consumers do not overvalue one policy compared to the other. If higher evaluations of policy-specific quality items cause prices to rise in our consumer-firm bilateral exchange model, then for the 1978 Canadian

5 For example, Consumers Union (1977, 73) reports that 'except for families that need forced savings or a tax shelter, CU judges term insurance to be more likely to meet those [the family's] needs.'

6 For example, Consumers Union (1977, 77) reports that 'on balance, CU favours participating policies for those people buying cash value life insurance.'

TABLE 10

Estimated model of consumer research and misperception for individual life insurance contracts

Sample	Constant	Age	No. of companies	Sex variable	Permanent insurance variable	Participating variable	Permanent participating variable	R^2
1	2.57*E*-02[a]	-0.04*E*-02	0.05*E*-02	-0.90*E*-02	0.23*E*-02	0.67*E*-02	0.90*E*-02	0.54
	(8.88)	(-5.63)	(5.83)	(-6.56)	(1.24)	(3.18)	(4.69)	
2	3.78*E*-02	-0.04*E*-02	0.02*E*-02	-0.96*E*-02	-0.86*E*-02	2.61*E*-02	1.75*E*-02	0.47
	(9.13)	(-4.25)	(1.18)	(-4.93)	(-3.11)	(8.73)	(6.02)	
3	-4.36*E*-02	-0.05*E*-02	0.20*E*-02	-1.44*E*-02	-0.52*E*-02	1.77*E*-02	1.22*E*-02	0.86
	(-3.26)	(-4.83)	(6.62)	(-5.21)	(-0.90)	(6.44)	(1.62)	
4	3.06*E*-02	-0.04*E*-02	0.03*E*-02	-0.85*E*-02	-0.74*E*-02	2.32*E*-02	1.58*E*-02	0.63
	(10.66)	(-6.75)	(2.07)	(-6.33)	(-3.95)	(11.77)	(8.40)	
5	4.49*E*-02	-0.06*E*-02	0.03*E*-02	-1.19*E*-02	-0.24*E*-02	3.03*E*-02	3.01*E*-02	0.52
	(8.56)	(-5.32)	(2.07)	(-4.83)	(-0.68)	(7.99)	(8.46)	

[a] Read 2.57*E*-02 x 0.0257;

NOTE: *t*-statistics are reported in parentheses under each coefficient.

SOURCE: Consumers' Association of Canada (CAC), *Shoppers' Guide to Canadian Life Insurance*, 1978, 1979; New York State Department of Insurance (NYDI), *Consumers' Shopping Guide for Life Insurance*, 1977. Sample 1 is CAC 10-year IANC data 1978; sample 2 is CAC 10-year IANC data for 1979; sample 3 is NYDI data 1977; sample 4 is CAC 20-year IANC data 1978; sample 5 is CAC 20-year IANC data for 1979.

sample the conventional wisdom holds (if $\partial P^1 / \partial u^* > 0$, then $C_u < 0$). Consumers undervalue term insurance relative to whole life.

The Canadian data, collected and distributed by the Consumers' Association of Canada for the first time in 1978 and then again in 1979, raise an additional issue. There may be a selection bias. For example, it is reasonable to expect that firms that reported their prices and then appeared to be high-priced operations in 1978 may subsequently fail to report in 1979. Conversely, low-prices firms uncertain of their relative position who did not report in 1978 may be encouraged to do so in 1979. While the variance of relative prices may not change, the range of prices in real terms may decline, so that the reporting firms in 1979 may *not* constitute a random sample. But the locations of firms in the distribution of prices who reported in 1978 but did not report in 1979 compared to those who reported in 1979 but did not report in 1978 indicates no such bias.

Under our assumption of a constant variance to the marginal cost of search for consumers within each class of insurance, each estimated coefficient measures the marginal impact on the relative variability of prices. These estimates lend support to the theory that consumers alter their search and research patterns in a rational fashion conditional upon our model of the determination of equilibrium prices. The data do not permit any measurement of the efficiency of consumer search. For example, in terms of the estimated price equation, it is not possible to estimate σ_a^2, the variance of marginal search costs across consumers in each class of policies, because the model is underidentified. Consequently, we are unable to shed any light on the comparative advantage of life insurance firms over consumers in their negotiated exchange of insurance contracts. As the next chapter reveals, however, we do gain insights that lead to policy recommendation.

Table 11 reports the relative price variance elasticities evaluated at the mean of each respective variable for the relevant sample. For the most part, these point estimates of elasticities are less than one. A difference that emerges between the New York and Canadian samples is that increases in the number of underwriting firms has a larger impact on the dispersion of relative prices in New York than in Canada. an explanation may be found in the differences in the nature of the agency agreement between the two regions.

In New York, life insurance agents may be general agents that represent several life insurance firms unless any one firm restricts its own agents to sell exclusively for that firm. In Canada, life agents are restricted by law to work for only one life insurance firm.[7] Therefore, a New York consumer for each search

7 *S.*342(13) of the Ontario Insurance Act prohibits agents from acting for more than one company, except under the 'single-case agreement.' That agreement refers to a situation

of an agent obtains on average a larger number of contract offers than a Canadian consumer. In effect, each search in New York represents a higher productivity (lower cost) than the equivalent search in Canada. This stimulates consumer search activity. Consequently, for each level of marginal search costs and class of policies, New York consumers should be better informed than their Canadian counterpart. The net result is that any given pattern of search yields a larger dispersion of relative prices in New York than in Canada.[8]

PURE PRICE VARIABILITY

On balance, our model of equilibrium price determination in the sale of life insurance contracts yields either testable propositions which are not rejected by our tests or plausible explanations of the signs of regression coefficients where there are warring theoretical effects. However, there is the issue of whether or not other models of equilibrium price distribution are also consistent with the observed prices. This question is important because other models may point in quite different policy directions. For example, pure price uncertainty with homogenous quality with all buyers having identical search costs also generates an equilibrium distribution. It is obvious that any public policy on information should differ between a world of consumer ignorance in product quality and varying search costs and a world of consumer ignorance on firm price location with common consumer search cost.

An attractive treatment of a model with the location of prices unknown by each consumer and with consumers facing positive search costs is contained in Butters (1977). In the model with consumer search, consumers search for the lowest price and firms advertise prices (because the product is homogenous across firms). To apply this model to the market for life insurance contracts, we would need to assume that salesmen constitute a more efficient channel for the distribution of price information than the alternatives (flyer, media) available to the life insurance firm. Butters calculates the variance of the sales price

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where an agent may seek to underwrite insurance from a company he does not represent *provided* his own company does not underwrite the desired policy and consent in writing has been obtained to seek the policy elsewhere from his own company (with copies of the written consent submitted to the superintendent of insurance). In 1924 the Uniform Life Insurance Act was adopted by all provinces except Quebec in an attempt to introduce uniformity in the provincial laws concerning insurance.

8 New York has regulations (Section 213 of the New York State Insurance Act) which restrict the percentage of premiums that may be allocated to agents' commissions and expenses and to total expenses in general. No such rules exist in Canada. Thus there are at least two differences between Canada and New York agency arrangements.

TABLE II

Estimates of elasticities of the variance of the logarithm of prices of individual contracts, evaluated at the mean of respective variables

Sample	EL_1	EL_2	EL_3	EL_4	EL_5	EL_{*5}
1	-0.85*	0.51*	-0.24*	0.05	0.08*	0.16*
2	-0.69*	0.15*	-0.21*	-0.16*	0.62*	0.25*
3	-0.49*	2.19*	-0.20*	-0.07	0.25*	0.17*
4	-0.93*	0.33*	-0.25*	-0.18*	0.29*	0.20*
5	-0.87*	0.19*	-0.22*	-0.04*	0.24*	0.36*

NOTE: Elasticities based on coefficients significantly different from zero are marked with an asterisk. Superscripts in headings denote the following: 1 is Age; 2 is the number of companies; 3 is the sex variable (1=female, 0=male); 4 is permanent insurance (1=permanent insurance, 0 otherwise); 5 is participating insurance (1=participating insurance, 0 otherwise). The samples are described in the note to Table 10.

TABLE 12

Imputed hours (H_1,H_2) and search costs (S_1, S_2) for a pure price-search model of life insurance prices for 1977 corresponding to two values of firm costs of contract

Policy type	Age of consumer	No. companies	Male consumers				Female consumers			
			S_1	H_1	S_2	H_2	S_1	H_1	S_2	H_2
1 $25 000 yearly renewable term	25	7	$48	6.6	$42	5.8	$40	8.3	$36	7.4
	35	8	29	3.5	28	3.4	34	7.3	31	6.6
	45	8	35	4.2	38	4.6	39	8.5	39	8.5
	55	8	34	4.5	49	6.6	50	11.2	55	12.3
2 $100 000 yearly renewable term	25	8	94	12.9	88	12.1	69	14.2	68	14.0
	35	9	80	9.6	81	9.7	81	17.3	79	16.8
	45	9	127	15.3	134	16.1	125	27.1	126	27.3
	55	9	248	33.2	270	36.1	323	72.1	310	69.2
3 $25 000 25-year uniformlt rsducing term	25	19	39	5.4	36	5.0	43	8.8	37	7.6
	35	19	31	3.7	31	3.7	38	8.1	35	7.5
	45	18	42	5.1	46	5.5	44	9.5	44	9.5
4 $100 000 25-year uniformly reducing term	25	21	115	15.9	101	13.9	147	30.2	123	25.3
	35	21	123	14.7	119	14.3	136	29.0	125	26.7
	45	20	210	25.2	208	25.0	186	40.3	178	38.6
5 $100 000 5-year renewable and convertible term	25	32	133	18.3	122	16.8	132	27.2	120	24.7
	35	32	181	21.6	165	19.8	173	36.9	158	33.7
	45	32	200	24.1	194	23.3	300	65.0	272	59.0
	55	32	606	81.0	563	75.3	1051	234.6	929	207.5

6a $10 000 non-participating whole life (IANC-10 years)	25	34	35	4.8	33	4.5	40	8.2	36	7.4
	35	34	35	4.2	33	4.0	44	9.4	39	8.3
	45	34	41	4.9	40	4.8	69	15.0	62	13.4
	55	34	60	8.0	62	8.3	114	25.4	103	23.0
6b $10 000 non-participating whole life (IANC—20 years)	25	34	27	3.7	26	3.6	32	6.6	29	6.0
	35	34	28	3.4	28	3.4	40	8.5	38	8.1
	45	34	41	4.9	42	5.1	67	14.5	63	13.7
	55	34	51	6.7	57	7.6	101	22.5	96	21.4
7a $50 000 non-participating whole life (IANC—10 years)	25	34	201	27.7	178	24.5	248	51.0	209	43.0
	35	34	279	33.4	251	30.1	342	72.9	293	62.5
	45	34	364	43.8	332	40.0	511	110.8	447	97.0
	55	34	485	64.8	445	60.8	745	166.3	656	146.4
7b $50 000 non-participating whole life (IANC—20 years)	25	35	119	16.4	111	15.3	161	33.1	145	29.8
	35	34	171	20.4	162	19.4	236	50.3	214	45.6
	45	34	291	35.0	277	33.3	414	89.8	376	81.8
	55	34	342	45.7	350	46.8	602	134.4	553	123.4
8a $50 000 participating whole life (IANC—10 years)	25	29	256	35.3	225	31.0	240	49.4	207	42.6
	35	29	300	35.9	267	32.0	308	65.6	269	57.4
	45	29	384	46.2	350	42.1	421	91.3	374	81.1
	55	29	552	73.8	514	68.7	606	135.3	543	121.2
8b $50 000 participating whole life (IANC—20 years)	25	29	185	25.5	158	21.8	256	52.7	209	43.0
	35	29	215	25.7	190	22.3	276	58.8	238	50.7
	45	29	300	36.1	275	33.1	353	76.6	310	67.2
	55	29	446	59.6	427	57.1	546	121.8	491	110.0

SOURCE: Price data: Consumers' Association of Canada, *Shoppers' Guide to Life Insurance Prices*. Wage date: 1970 data from Gunderson (1976), 124, Table 4-10). Data are scaled to 1977 by setting 1970 wages and salaries per labour force employed equal to one and calculating the corresponding 1977 value. The respective figures are as follows: Male: $7.26 (25-34 years), $8.35 (35-44 years), $8.31 (45-54 years), $7.48 (55-64 years); female: $4.86 (25-34 years), $4.69 (35-44 years), $4.61 (45-54 years), $4.48 (55-64 years).

distribution (ibid., 474). The variance depends on the marginal cost of a price-advertising message to reach a single buyer, the difference between the maximum per-unit price and a break-even (minimum) price excluding advertising (agency) costs, and the total costs of consumer search.

This study uses the Butters variance formula and our price data on individual life insurance prices to calculate the dollars spent optimally on price search by consumers in the Canadian insurance market for individual contracts in 1977. The 'test' of this pure price uncertainty approach is to ask whether or not the estimates of optimal consumer search activity implicit in the existing observed price data are consistently reasonable, given some external standard.

First, we obtain estimates of the variances of individual life insurance prices by class of contract for 1977. Next, we estimate the marginal cost of advertising as either 10 per cent or 30 per cent of the premium price of the lowest-priced firms for each contract class. In a model of price uncertainty, the advertising messages of the lowest-priced firm should be the most efficient in attracting consumers. We choose the two estimates of the marginal advertising cost to test the sensitivity of our results to this parameter. (For a sample of forty-six Canadian life insurance firms in 1976, commissions as a percentage of premium revenue are on average 17 per cent and range from a low of 0 for direct underwriters to a high of 46 per cent.) Finally, we may measure directly for each contract class the difference between the maximum per-unit price and the minimum per-unit price in that contract class.

Based on these estimates, assuming a price equilibrium in the Butters sense and using Butters's formula for the variance of prices in that equilibrium, we may calculate the dollars spent optimally on price search by consumers in the Canadian life insurance market in 1977. These dollar estimates are reported in Table 12 as S_1 (corresponding to an advertising price equal to 10 per cent of the premium price of the lowest-priced firm) and S_2 (corresponding to an advertising price equal to 30 per cent of the premium price of the lowest-priced firm). By using estimates by age and by sex of 1977 wage rates in Canada, we may obtain estimates of the optimal number of hours each consumer would search so that the observed distribution of prices is the optimal distribution of prices. These hour estimates are reported in Table 12 as H_1 (corresponding to S_1) and H_2 (corresponding to S_2).

An inspection of this table reveals that these results are not consistently reasonable. For example, a 25-year-old male wishing to buy a $25000 yearly renewable term policy would search in equilibrium for 6.6 hours over seven companies underwriting the product. However, a 55-year-old female wishing to buy a $100000 five-year renewable and convertible term policy would search in equilibrium for 234.6 hours over thirty-four companies underwriting the

product. (In interpreting these results we need to remember that the Butters variance calculations assume many buyers and sellers.)

CONCLUSIONS

Consumers of life insurance products are assumed to be uninformed at first about alternative products available in the industry and the varying attributes of similar policies from different suppliers. However, consumers are capable of pre-purchase research on substitute products and search across alternative suppliers. Whatever their productivity levels, we would expect consumers to search more intensively where the payoff from the product is greater. Our empirical work for price equilibrium in markets for individual insurance contracts is consistent with a model predicated on such consumer behaviour. As well, we would predict that, other things equal, groups of consumers would search more intensively than individual consumers to exploit the public-good characteristics of information.

There do not appear to be significant barriers to entry into the life insurance industry. It is argued here that life insurance firms discriminate between consumers of their products according to the price elasticity of the consumers. Price elasticity, in turn, depends directly on the consumer's level of knowledge about the products. In the long run, we would expect a zero-profit equilibrium akin to a Chamberlinian equilibrium. The one difference is that in our model each firm operates with an efficient plant scale. Life insurance firms are of different sizes in long-run equilibrium even though each uses the same efficient head-office technology as life insurance firms in different segments of the retail market (where a segment is defined by the price elasticity of the firm's consumers) employ varying agency sizes and advertising budgets which alter the efficient firm size. Each life insurance firm must price-discriminate to survive.

However, as we have known for some time, zero long-run profits do *not* necessarily result in socially optimal packages of insurance coverage or annuity size in terms of price, coverage, sales, effort, and quality. The next chapter explores these welfare issues more completely.

7
Sales efforts in individual life insurance markets

INTRODUCTION

This chapter attempts to demonstrate that even though in industry equilibrium the life insurance firms earn only normal rates of return and charge prices equal to marginal costs, informational problems still cause welfare deficiencies. A potential role for public policy thus exists in this industry.

In our model of negotiated bilateral sale of individual life insurance, agents have played a crucial but passive role. Agents screen consumers for the company by aligning consumers with the 'appropriate' policy. These agents facilitate the price discrimination that is essential for survival in this industry. So far, each contract sold requires a fixed and invariable number of hours of time for each agent. This assumption assigns a passive role to each life insurance agent that is at odds with descriptive reality. Any consumer acquainted with the sale of individual life insurance products knows that agents play an active 'persuasive' role.

One of the difficulties with the current institutional arrangements for life insurance agents is that they are agents of the selling company and their commissions are dependent on gross premium revenues. In equilibrium, we expect agents to make competitive wages. The problem is that maximizing the post-purchase satisfaction of the consumer subject to the consumer's resources may not be in the profit-maximizing interests of either the underwriting firm or its agents. Therefore, to the extent that consumers are uninformed, it is rational for life insurance firms and their agents to exploit these misperceptions. Nor, for the reasons advanced earlier, can we expect the market to discipline life insurance firms via the competitive mechanism.

Not only are agents an important part of the production and distribution of life insurance but their fees represent a large and stable proportion of total

TABLE 13

Agent-related expenses as a percentage of total expenses for Canadian life insurance companies

	1976	1966	1954
Average of agent expenses as a proportion of total expenses	0.32	0.35	0.38
Maximum agent expenses as a proportion of total expenses	0.75	0.52	0.54
Minimum agent expenses as a proportion of total expenses	0	0.15	0.04
Coefficient of variability for agent expenses as a proportion of total expenses	0.55	0.25	0.03
Number of Canadian companies	57	40	31

SOURCE: Superintendent of Insurance for Canada (1954, 1966, 1976)

expenses for life insurance company. Table 13 reports the ratio of agent-related expenses including commissions to agents as a percentage of total expenses for a set of Canadian life insurance companies in 1976, 1966, and 1954. Pairwise tests of differences in the means of this ratio across the three years indicate, at the 5 per cent level of significance, two-tailed, that the null hypothesis of equal means cannot be rejected. Therefore, average agent-related expenses as a percentage of total expenses appear to be stable over the past twenty years. Table 13 reveals that in 1976 some companies were direct underwriters, incurring no agent expenses. However, these direct underwriters are few and responsible for a small proportion of the total individual life insurance transacted. In the context of our model of consumer search and research, these facts suggest that there are few fully informed purchasers of life insurance.

WELFARE ECONOMICS OF SALES EFFORT

For the most part, life insurance salesmen are paid commissions that depend directly on the gross premium revenue they generate for the life insurance firm. The fact that commission rates vary with policy types suggests that the rates reflect a firm's profits from each kind of policy. At least we would expect firms maximizing their discounted stream of profits (current profits in our static model) to behave in this fashion.[1] The courses of study a candidate must complete to be sponsored as an agent by a life insurance company are neither lengthy nor difficult enough to be regarded as any great barrier to entry into the

1 It is well known that firms that wish to maximize the present value of profits set up conflicting objectives if they pay their agents a commission based on gross (premium) revenues rather than profits.

agency business. Therefore we may assume that life insurance firms compete in a competitive factor market. Agency input is measured in terms of units of sales effort defined as Z. If we define B as the commission rate ($0 < B < 1$) and use the model of the previous chapter, payments to agents from the sale of a contract in any class i of policies l may be defined as $B[\eta\mu^{\eta} + (h_l + u_l)] \equiv w.S$, where w (as before) represents the competitive wage rate, $S \equiv \bar{s} + s$, $\bar{s}$ is the hours of the salesman's time spent on screening each consumer, and s is the hours of the salesman's time spent on persuading the consumer. We assume that a constant number of hours are required to screen each consumer and a variable number of hours to persuade a consumer of the merits of a policy.

In our specification consumers hold no potential misperceptions about firm-specific quality. They know the distribution of firm quality, but they do not know without search the location of each firm in the quality distribution. In this search specification, there is no persuasive role for salesmen. However, our consumers may hold imperfect views on policy quality, represented by the post-research error term u_l, which may be either positive (overvaluation) or negative (undervaluation). Whatever the size of u_l, it is in the interest of the underwriting firm and its sales agent to increase u_l. Therefore, we specify $u_l = u_l(s)$, where $u' > 0$ and $u'' < 0$. Depending on the short-run equilibrium, it may be in the interest of firms to work to persuade consumers to alter their rank ordering of policies towards those that represent greater profits for the firm. In the long run we expect entry to render all policies equally profitable. We now consider a redefinition of the firm's expected-profit function to define optimal variable sales effort. First, we define for each policy and class of contracts

$$\Phi(s) \equiv \max_{\mu}[\Gamma\eta\mu^{\eta} + \mu u^{*}(s) - \Gamma\mu],$$

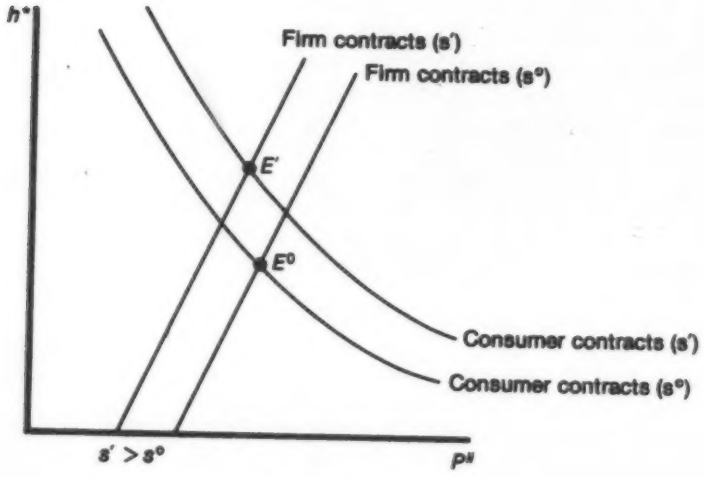
where we assume that $\Phi' > 0$, $\Phi'' < 0$. We now ignore explicit advertising expenditures because they are inconsequential for our welfare analysis. Under these conditions, expected profits for each class of contracts and policies may be redefined as

$$E\pi \equiv (\Phi(s) - ws)m - G(m, w) - C,$$

where expected profits are assumed to be concave in (m, s) and $G(m, w)$ (as before) includes the agent screening costs that are the same for every contract sold.

Decisions on the number of contracts and the amount of sales effort to maximize expected profits for each class of contracts and policies may be defined as

Figure 6
Impact on the consumer firm price-quality equilibrium of an increase in sales effort



$$\Phi(s) = G_m + ws, \tag{32}$$

$$\Phi' = w. \tag{33}$$

Equation (32) says that life insurance firms write contracts until the marginal or average revenue per contract equals the marginal contract costs including salesmen's commissions. Equation (33) says that it is in the firm interest to use selling efforts per contract sold until the marginal value of such efforts just equals the marginal costs.

The firm is now aware of its power through sales effort to change consumer perceptions directly and thus alter the coverage-firm-quality equilibrium developed in the previous two chapters. In fact, $\partial h^* / \partial s = H\mu' / [\Gamma\eta^2(\eta - 1)\mu^{\eta-1} H_h] > 0$ and $\partial P^{\#} / \partial s < ? > 0$, where all variables are previously defined. These facts are useful for our welfare analysis. With an increase in sales effort, each consumer thinks more highly of the contract and therefore is prepared to search more carefully for a better deal. In our consumer-firm equilibrium, the consumer search path shifts upward. As sales efforts increase consumer valuations and as consumers search more, price elasticities increase, so that the power of

underwriting insurance firms to price-discriminate is reduced. Consequently, for each level of firm quality, price is reduced, so that the firm price path shifts to the left. These changes in the consumer-firm equilibrium are shown in Figure 6. Although the effect of increased sales effort is to increase the level of firm-specific quality, the price change depends on the net change in the two reaction paths. This discussion assumes that sales efforts do *not* result in a change in the rank ordering of policies, so that the policy selected by the consumer remains unchanged. Of course this need not be the case.

The lack of information on the allocation of sales effort by policy by firm precludes any empirical analysis of the impact on prices of variation in the perceived quality of life insurance policies due to the variation in sales efforts across firms within classes of contracts and policies. However, our specification does capture the institutional features of sales effort and permits us to evaluate its welfare effects.

To perform this evaluation, we need a measure of social welfare to serve as a criterion to judge the appropriateness of any selling effort. The appropriate welfare measure for consumers is *ex post* or realized welfare rather than the *ex ante* or expected utility used by consumers in their decisions to engage in search and research to buy death benefits, and subsequently used by firms to maximize profits. Realized utility is the set of monetary valuations that an insurance expert or the life insurance company itself could reveal to the consumer if either had an incentive to do so. While this measure assumes a state of full information on the selection of a policy by consumers, consumers still face search expenditures among firms and the risk of death. Firm search is included in the welfare valuation because, in the presence of varying consumer opportunity costs to search, contracts of varying quality are offered by firms, and there are always legitimate social costs and benefits associated with matching consumers to firms.[2] Therefore, we evaluate the benefits and costs accruing to the consumer as the expected benefits and costs from the optimal search rule defined by h^*. In this case, following Lippman and McCall (1976), the 'realized' utility for our typical consumer (defined as EU_i^j) becomes

$$EU_i^j\big|_{h^*} \equiv y + \Gamma\mu \ + \mu h^* - \mu P^{h^*}, \tag{34}$$

where the expected firm quality net of search costs is the reservation value of firm quality. Notice that unlike expected consumer utility, realized utility does

2 To the extent that policy research and firm search by a single consumer have public-good characteristics, there may be an underallocation of resources to these efforts due to a non-appropriation of the return. Such effects do not appear explicitly in our welfare calculations.

not include $u^*(s)$, because the true value of $u^*(s)$ is zero. This opens up the possibility of beneficial ($u^* > 0$) or harmful cheating ($u^* < 0$) effects due simply to the deviations between the anticipated and realized utility measures.

Welfare is defined in the conventional utilitarian fashion as the sum of consumer's and producer's surplus, summed over all consumers and firms in the industry at a given time. In this case, expected welfare EW for each class of contracts sold may be written as

$$\text{EW} \equiv \sum_j [\text{EU}_i^j + NE\pi],$$

where M and N are respectively the number of consumers and firms for each class of contracts and all other variables are previously defined.

Because of the independence of policies on both the demand and supply side and the consequent independence of the sales effort, it is sufficient to investigate the welfare effects of the sales effort for one class of contracts. We proceed by treating sales effort s as a parameter. Further, we impose a long-run industry equilibrium on each segment of the market. For the typical segment selected, we define N^* to be the number of firms such that $E\pi = 0$ for firms in that segment. The welfare effects of sales efforts are investigated by evaluating the sign of the marginal social welfare of the sales effort at the levels of all variables found to be in the profit-maximizing interests of life insurance firms in a long-run industry equilibrium. For notational convenience we define $v^* \equiv (\mu^*, h^*, m^*, s^*, N^*)$ as the vector of endogenous variables that are optimal in our context for our typical segment of the retail market for life insurance.

Obviously, by definition, $dE\pi/ds \ (v = v^*) = 0$ and $E\pi(v = v^*) = 0$, $dN/ds(v = v^*) = 0$. This means that at v^* no firms are induced to enter or leave in response to marginal adjustments in sales effort. As well, we assume that all consumers are aware of the existence of life insurance and all buy one policy or another. Therefore, $dM/ds(v = v^*) = 0$. This rules out a purely informative role for sales effort in informing some consumers of the very existence of life insurance. Such a result is inherent in our specifications of consumer research over policy types and the determination of optimal search rules over competing firms before contact with a life insurance agent. For the moment, we assume that sales efforts do *not* cause consumers to reorder the policies they have reached. Inclusion of this possibility yields only obvious effects, to be discussed later.

Evaluated at the relevant optimal conditions under the assumptions of this model, marginal social welfare for a typical class of contracts becomes

$$d\text{EW}/ds|_{v^*} = \sum_j [M d\text{EU}_i^j/ds|_{v^*}]. \tag{35}$$

It is immediately apparent that sales efforts that maximize firm profits at zero in industry equilibrium do not maximize social welfare unless $d\,\mathrm{EU}_r / ds(v = v^*) = 0$, which generally does not hold. Upon expansion, $d\,\mathrm{EU}_r^j / ds(v = v^*)$ becomes

$$d\mathrm{EU}_r^j / ds\big|_{v^*} = [-u^*(s)\,\partial\mu^* / \partial s + \mu^*(\partial h^* / \partial s - \partial P^k / \partial s)]\big|_{v^*}. \tag{36}$$

Our model permits a further simplification in the second term of (36). Before doing so, we shall interpret this effect. Figure 6 aids in this interpretation. Additional sales efforts alter the negotiated consumer-firm bilateral equilibrium shown in Figure 6. Realized firm-specific quality is increased by such additional sales efforts ($\partial h^* / \partial s > 0$), a beneficial effect. The effect of additional sales efforts on the equilibrium price is uncertain. To the extent that this price rises (falls), additional sales efforts generate a harmful (beneficial) effect.

From the comparative statics of Chapter 5 on the negotiated consumer-firm equilibrium, we may show that $\mu^*(\partial h^* / \partial s - \partial P^k / \partial s)\ (v = v^*) = \mu^* u^{*\prime}(s^*)\ (1 - \eta) / \eta$. This result tells us that while Figure 6 indicates that the net result of increased sales effort on the ratio of firm-specific quality to price appears to be uncertain, the algebra indicates that under our specification the increase in negotiated quality always outweighs any increase in price. In fact, from (33) $\mu^* u^{*\prime}(s) = w$. The consequence is that the critical marginal social welfare evaluation (35) becomes

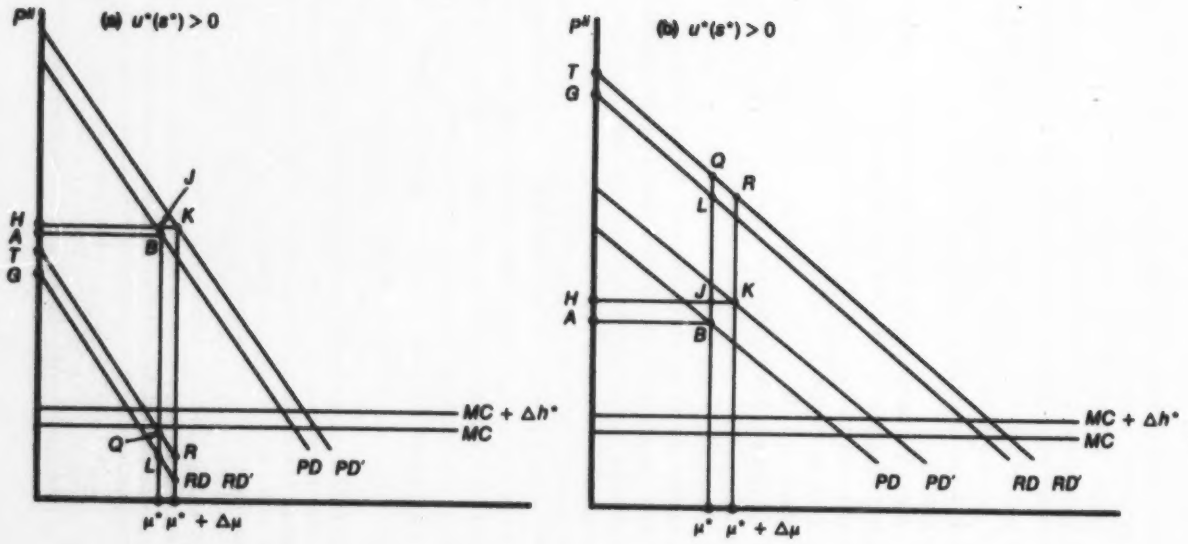
$$d\mathrm{EW} / ds\big|_{v^*} = \Sigma M(-u^*(s)\partial\mu^* / \partial s\big|_{v^*} + w(1 - \eta) / \eta), \tag{37}$$

where $\partial\mu^* / \partial s\big|_{v^*} > 0$.

While the sign of the marginal social welfare of the sales effort is ambiguous, each of the terms affords an economic interpretation. In the first term, if the sales efforts increase, consumers purchase additional death benefits. They are better off if they undervalue the policy ($u_j^* < 0$) and worse off if they overvalue the policy ($u_j^* > 0$). Sufficient overvaluation can cause consumers to purchase the wrong policy. These results occur when the life insurance firm uses the socially incorrect indicator of relative perceptions of alternative life insurance contracts. For profit the expectation and not the realization of policy quality matters, but for welfare just the opposite holds.

The second term is positive and reflects the net effect of increased sales efforts on consumer search and the equilibrium price. $\mu^*(\partial h^* / \partial s - \partial P^k / \partial s)(v = v^*) = w(1 - \eta) / \eta$ measures the effect on price, including expected search costs, of an increase in sales effort minus the expected return from increased search due to increased sales efforts at a given level of death benefits. This term appears in the social evaluation and not the private consumer evaluation, because consumers

Figure 7
Change in welfare from an increase in sales effort



The expected demand curve is *PD* before and *PD'* after an increase in sales effort; the realized demand curve is *RD* before and *RD'* after an increase in sales effort; *MC* is the expected pay-out costs before and increase in sales effort; and Δh^* is the increase in consumer search and firm quality due to an increase in sales effort.

are unaware of the effects of their willingness to search more assiduously for final equilibrium price and realized quality. As each increment in the consumer's reservation firm quality is self-fulfilling and yields an exactly offsetting increment in price in the absence of any consumer misperceptions, the additional search induced by sales effort has no direct effect on welfare. However, since price elasticity at the optimal level of coverage is increased by changes in sales effort, each firm suffers a consequent reduction in its ability to price-discriminate against consumers. This indirect effect yields an unexpected net benefit to consumers.

Each of the terms in the welfare analysis, defined by (37), is represented in Figure 7a, $u^*(s) > 0$ (consumers overvalue the product), and 7b, $u^*(s) < 0$ (consumers undervalue the product). $-u^* \partial \mu^* / \partial s$ is represented by $JKRQ$ (a loss in Figure 7a, a gain in Figure 7b); $\mu^* \partial h^* / \partial s$ is represented by $TQLG$; $-\mu^* \partial P^j / \partial s$ is represented by $-HJBA$. The analysis informs us that $TQLG - HJBA > 0$. Gains in expected revenues from increased sales efforts are just offset by the increased cost. All existing firms write the same number of contracts and continue to be viable.[3]

Therefore, consumer overvaluation of life insurance is necessary but not sufficient for excessive private sales effort. Further insight is gained by investigating the critical minimum amount of overvaluation that must occur for private sales effort to be excessive. Consumer policy evaluation and coverage are related through the profit-maximizing decision on coverage for each firm (equation (21) in Chapter 4). Those critical levels are determined by two parameters: Γ, the probability of death and η, the utility elasticity of death benefits (see the Mathematical note for the details of derivation). η may be reinterpreted in the form of the elasticity of substitution between income and death benefits defined as $\sigma_{\mu y} \equiv 1/(1 - \eta)$, where $\partial \sigma_{\mu y} / \partial \eta > 0$. As η increases, critical coverage

3 The welfare effects of sales efforts and product quality presented in this model differ somewhat from welfare effects in other analyses of quality. Unlike Spence (1975), there is no distinction between marginal and average consumers, because firms price-discriminate over each contract sold, so that all consumers are marginal consumers. Unlike informative advertising in Kotowitz and Mathewson (1979), there are no marginal consumer effects due to learning of the existence of the good as there is an inelastic number of consumers, all buying an insurance policy. Unlike advertising in Kotowitz and Mathewson (1979a), there are no intertemporal effects, because it is argued that life insurance is not a candidate commodity for learning through experience with the good. If we adopt the post-sales-effort welfare criterion used in Dixit and Norman (1978), the marginal social welfare of sales efforts reduce to $dEW / ds(v = v^e) = \sum_j h dw(1 - \eta) / \eta > 0$, i.e. even though insurance sales efforts may induce serious misperception, there is a social deficiency of such sales effort, a curious result. However, post-sales-effort evaluations are inappropriate measures of social welfare.

Mathematical note

Welfare effects of sales efforts

From (21), $\partial\mu^*/\partial s = -u'/[\Gamma\eta^2(\eta-1)\mu^{\eta-2}] > 0$. As well at s^*, from (33) and the definition of $\Phi(s)$, $\mu^* u' = w$. Therefore, upon substitution, we obtain $\partial\mu^*/\partial s(v = v^*) = -w/[\partial\eta^2(\eta-1)\mu^{\eta-1}]$.

If we substitute this expression into (36), we obtain

$$d\mathrm{EU}_\eta/ds_{\,v} = w[u^*/(\Gamma\eta^2(\eta-1)\mu^{\eta-1}) + (1-\eta)]/\eta. \tag{38}$$

For private sales efforts to be socially excessive, we must have $d\mathrm{EW}/ds(v = v^*) < 0$. From (38), we see that $u^* > 0$ is a necessary but not a sufficient condition for private sales efforts to be socially excessive.

From (38), a necessary and sufficient condition is that

$$u^*/(\Gamma\eta^2(\eta-1)\mu^{\eta-1}) + (1-\eta) < 0,$$

or that

$$u^* > \Gamma\eta^2(1-\eta)^2\mu^{\eta-1}.$$

Define critical levels $(\tilde{u}^*, \tilde{\mu}^*)$ so that

$$\tilde{u}^* = \Gamma\eta^2(1-\eta)^2\,\tilde{\mu}^{*\eta-1} \tag{39}$$

and the profit-maximizing coverage equation (33) is satisfied. Solving (33) and (39) simultaneously yields

$$\tilde{u}^* = \Gamma(1-\eta)^2/(\eta^2 - 2\eta + 2), \tag{40}$$

$$\tilde{\mu}^* = \eta^2(\eta^2 - 2\eta + 2)^{1/(1-\eta)}. \tag{41}$$

Values of $(\tilde{u}^*, \tilde{\mu}^*)$ reported in Table 13 are obtained by scaling $(\tilde{u}^*, \tilde{\mu}^*)$ in 10^3 dollars and substituting into (40) and (41) the respective parameter values.

increases and critical overvaluation declines. As Γ increases, critical coverage is unchanged and critical overvaluation increases.

Table 14 lists several calculated coverage and overvaluation values. Death benefits are scaled in hundreds of thousands of dollars. For example, for $\Gamma = 0.5$ and $\eta = 0.8$ ($\sigma_{\mu y} = 5$), optimal coverage is \$78,000, while the minimum overvaluation sufficient to yield excessive private sales efforts is just over \$60. When elasticities of substitution become rather low ($\sigma_{\mu y} = \cdot$ or $\eta = 0.1$) and probabilities of death somewhat high ($\Gamma = 0.5$), critical overvaluation as a percentage of critical death benefits remain below 25 per cent (\$432.50/\$1933.00 ≃ 0.22). Therefore,

TABLE 14

Critical overvaluation and coverage for private sales efforts to be excessive

Probability of death (Γ)	Elasticity of substitution between increased death benefits and income ($=1/(1-\eta)$)	Critical death benefits ($)	Critical over-valuation ($)
0.5	5	78 000	60.0
0.2	5	78 000	24.0
0.1	5	78 000	11.7
0.5	1.7	26 000	244.7
0.2	1.7	26 000	97.9
0.1	1.7	26 000	48.9
0.5	1.1	1 933	432.5
0.2	1.1	1 933	173.0
0.1	1.1	1 933	86.5

the impression is that the critical overvaluation in relation to death benefits does not have to be a large number before private sales efforts are socially excessive.

Any case for excessive sales efforts by life insurance firms is only strengthened by the inclusion of effects that induce consumers to switch to inferior policies that are more profitable for firms, at least in the short run. In this case, added to the marginal social welfare effects of equation (36), would be an item representing the forgone consumer surplus for those consumers induced by the additional selling effort to switch to an inferior life insurance policy.

In light of our model, industry commentators who feel that private sales efforts are excessive have a choice of two arguments. They may argue that these sales efforts at the margin induce consumers to select policies and coverage sufficiently different from their *ex post* fully informed equilibrium that there are significant welfare losses whatever the offsetting effects. Alternatively, they can argue that these sales efforts at the margin induce misperception and overvaluation that stimulate enough excess coverage, (together with inappropriate policy selection) to dominate any changes in the terms of trade that benefit consumers, that is, any increased price elasticities.

8
Conclusions

This study began with several economic questions on the nature of markets for life insurance. We saw that the same life insurance product was priced differently in different life insurance policies and in different underwriting life insurance firms. For given policies these price differences were attributed to differences in the abilities of and costs to consumers seeking information about life insurance products. Informational disadvantages seemed to be greater for individual consumers of life insurance than for groups of consumers purchasing life insurance collectively. It is rational for suppliers of life insurance to exploit such consumer differences, whatever other characteristics may influence the design of policies and contracts. In fact, competitive pressure forces life insurance firms to price-discriminate between consumers according to their knowledge of product alternatives. Those firms that fail to do so are destined to disappear from the marketplace. Furthermore, informational brokers would not emerge in this market as poorly informed consumers would have as much difficulty in assessing the relative quality of such middlemen as they do ranking the relative quality of the underwriting insurance firm. Therefore, the market fails to provide adequate information.

These hypotheses are supported by the available data on individual life insurance contracts. In particular, we found that younger consumers and women face greater price discrimination that older consumers and men. There is no strong evidence that consumers value term policies less than whole life policies, although they do seem to undervalue participating whole life contracts compared to non-participating ones.

The essential ingredient that facilitates price discrimination is the life insurance agent, who can accurately sort consumers by their knowledge of product alternatives as reflected in their price elasticity of demand. In fact, life insurance agents play a dual role. Not only must they sort consumers by their price

elasticities but they can also influence the evaluation of contract alternatives by consumers through sales efforts. This has two possible consequences. First, it may cause consumers to reorder their ranking of contract types. To the extent that such reordering corresponds to the true value of policy alternatives for the circumstances of any single consumer, such sales efforts are socially beneficial. Otherwise, they are socially harmful. Secondly, by inducing consumers to increase their evaluation of the selected policies, sales efforts increase the demand for coverage for consumers and encourage consumers to search more carefully among competing underwriting firms. Social welfare is improved by additional consumer search because informed consumers are less amenable to price discrimination. Additional coverage induced by sales effort is socially beneficial if consumers formerly undervalued life insurance and socially harmful if they formerly overvalued it.

There are two conditions for sales effort to be socially excessive. Consumers may be induced to substitute inferior but more profitable policies or to overinsure. Such negative effects must be large enough to overcome any beneficial effects from improved knowledge and the reduced price elasticities that stem from the additional consumer incentive to search more assiduously in light of more highly evaluated policies. It appears that improvements in the negotiating positions of consumers brought about by sales efforts are *small* compared to the harmful effects of overvaluation. Therefore, viewed simply from the standpoint of resource efficiency, even if sales efforts left the choice of contract unaltered and affected only the amount of coverage purchased, they would probably be excessive.

This welfare analysis is predicated on a high degree of competition in the supply of life insurance where life insurance firms set the price of a contract equal to its marginal cost. We have assumed conditions of open entry into the industry and competitive finance markets which leave life insurance firms earning only normal rates of return in the long run. Although other analysts have reported evidence of natural monopoly tendencies in this industry, our empirical evidence suggests on the contrary that there are no such tendencies in the Canadian industry and for the most part firms in this industry do not make excess profits. Further, our model offers an explanation of the tremendous diversity in the size of life insurance firms in spite of access to the same underlying production technology. This diversity arises from the different marketing and sales efforts that life insurance firms must undertake to sustain their operations in their particular segments of the life insurance retail market. According to this explanation, large firms with large sales and marketing expenses per contract tend to service segments of the market characterized by ill-informed consumers who are relatively more price-inelastic for any given size

of contract. The evidence that life insurance firms set prices equal to marginal costs and do not earn excessive rates of return indicates also that non-informational aspects of the market for life insurance work well according to the usual competitive criterion.

What role is there for public policy in the life insurance industry? There is already a significant public policy involvement in this industry through reserve requirements and investment portfolio constraints. But such restrictions, though they may help equalize the probability of bankruptcy among life insurance firms, do not go to the heart of the informational issues discussed in this analysis.

If, as this study suggests, there are no natural monopoly tendencies in this industry, there is no advantage to firm size in the life insurance industry in relation to the size of the market. Consequently, none of the usual anti-trust-regulatory tools seem applicable to this industry.

However, public policy could seek to create a better balance between the bargaining powers of the consumer and the life insurance firm in their negotiated bilateral contract exchange. In fact, the public sector has a choice. It can either stimulate consumer research on policy alternatives and search across competing firms or, as in New York, Illinois, and Wisconsin, it can limit or regulate life insurance firms' expenses on agents. The problem with limiting agents' behaviour is that the screening and sorting activities of agents necessary for firm survival in the long run are inseparable from their sales efforts. Expense limitation laws would therefore reduce both, removing service from some segments of the market. While life insurance firms would save agents' expenses, they would lose even more in revenues, so that servicing these segments of the market would become unprofitable. However, leaving aside the possibility of massive over- or undervaluation of policies by consumers and their switching to inferior policies, unserviced market segments that were previously profitable mean a loss of surplus to consumers from the unavailability of products. Everything considered, therefore, expense limitation regulations would harm resource allocation.

Instead public policy should be directed at reducing the cost of consumer self-protection by stimulating increased research effort and search activities. Some observers argue that, whatever the abilities of people to learn about consumption and savings alternatives generally, consumers are particularly inept at selecting life insurance contracts. The estimation of our model of individual life insurance sales does not permit an estimate of the efficiency of consumer search. However, that view is consistent with rational consumer behaviour in the sense that increases in the probability of payoff from a life insurance policy increase the intensity of consumer search across underwriting

life insurance firms. Therefore, the policy question is how to reduce (improve) marginal search costs (productivity) for consumers to redress any imbalance in relative bargaining strengths between the consumer and the life insurance agent.

One change that could benefit consumers would be to alter the Insurance Act to allow agents to be general agents that sell for more than one company (see Chap. 6, n.7). In the United States there are no laws restricting each agent's activity to one firm, although many large American life insurance firms restrict their agents to exclusive sales. Firms naturally favour such restrictions, and life insurance agents oppose them. Together with non-vestiture of residual commissions (which causes agents to forfeit remaining commissions on policies they previously sold for the firm), they restrict agent mobility. But large firms are better able to attract agents in spite of this restriction because new agents can trade more effectively on firm goodwill, which is larger for better-known firms.

If agents are initially undifferentiated and find it impossible to signal their relative productivity (which they may not even know at first), then all receive the same package of remuneration from any given firm. In such a world, relative productivities are revealed only through performance. Under flexible institutional arrangements more productive agents should receive rents on their differential skills. However, single-company sponsorship and the loss of residual commissions when agents leave to work elsewhere mean that life insurance firms should capture at least some of these skill-specific rents, so that the firms are better off and the better agents worse off. However, these are only transfers and have no consequence for resource allocation.

For our analysis, the issue is whether or not consumers would be better off with general agents. One argument is that agents who can represent more than one company would be in a position to shop among competing underwriters for the best contract for their clients. However, this would be the case only if the incentive structure for agents were changed as well. As long as the information held by consumers of life insurance does not change, neither does the expected behaviour of the agents.

With general agencies that represent more than one underwriting firm, consumer search would be more productive. Each consumer search would now yield several price and quality observations. Improved consumer search should yield reduced relative price variability.[1] There is no guarantee that general agents would reduce consumer misperception of the relative merits of different life

1 Mathewson and Winter (forthcoming) report empirical results from an expanded data set which includes interest-adjusted net cost insurance data for Pennsylvania for 1974-5. Pennsylvania, unlike Canada, has general life insurance agents. These results indicate that general agency reduces relative price dispersion and are consistent with the hypothesis that general agencies improve the efficiency of consumer search.

insurance policies. In our model, consumers form prior opinions on the relative merits of policies, and these may be changed by life insurance agents at the point of sale. The changes may or may not be welfare improving. General agency arrangements do not alter either consumer prior information or agency incentives. Thus there is no reason to expect any change in consumer misperceptions on policies to result from a decline in exclusive agency agreements.

It has been argued that more highly qualified agents would have stronger incentives to impart better information to consumers. However, this argument is faulty. More qualified agents would not alter consumers' information costs or technology, so they would operate under precisely the same incentive structure as less qualified agents. But there is one difference: it would be increasingly difficult to become a life insurance agent, so that those already certified would enjoy monopoly privileges.

There are two additional public policy responses to this information imbalance. First, governments can become disseminators of information. For example, in Canada, governments could produce annual shoppers' guides to life insurance policies, thereby guaranteeing that policy prices for all underwriters would be included. Elsewhere it has been argued that company retention indices are better price indices than interest-adjusted net cost figures.[2] At the same time, governments could either issue information on policy characteristics in booklets or answer consumer questions on government phone-in lines. It is important to stress that any advice on policy characteristics must be simple and easily understood. Otherwise it would simply add more noise to the system and increase rather than decrease consumer information costs.

Secondly, governments can strengthen the legal liability of underwriting insurance firms for the advice and information offered by their agents. Though the information imparted by agents as part of their sales effort has a low cost to the consumer, it has a strong influence on them. It is naturally difficult to monitor the statements of individual agents to consumers in private negotiations. But consumers should obtain advice in signed statements, and all agents should be required to present to prospective consumers before a sale is made the publicly prepared and funded life insurance guides. Finally, 'cooling-off' periods of six months or longer after each sale are desirable, where life insurance contracts, except for administrative costs incurred by the life insurance firm, may be rendered null and void at the consumer's discretion.

It is important to add that while the analysis undertaken in this research provides strong evidence on the correct *direction* for appropriate public policy, it does not indicate the *magnitude* of that program. The latter would clearly

2 Mathewson and Winter (1981: 85-7) and Winter (1980) discuss the merits of alternative price indices for the comparison of life insurance contracts.

depend on the costs and benefits of particular policies, and more experimental evidence would be needed to make that assessment.

PART TWO: OVERVIEW AND POLICY RECOMMENDATIONS

Overview and policy recommendations

This chapter summarizes the findings of the study, discusses further aspects of the life insurance market, and presents a number of policy proposals to enable the life insurance industry both to serve the consumer better and to lower the cost of life insurance. Some of the policy proposals follow directly from the analysis of the preceding chapters; others flow from a more general examination of the industry, its products, and its operating characteristics from the standpoint of an economist.

REGULATORY OBJECTIVES

The usual anti-trust regulatory tools are not applicable to the life insurance industry since, as we have seen, it exhibits no excessive market power that needs to be limited. Nor does it need protection against foreign competition, economic instability, or other uncertainties. The industry has shown itself to be strong enough to exist without protective regulatory crutches.

What then should public policy seek to achieve in the life insurance industry? A traditional objective has been reflected in reserve requirements and investment portfolio constraints, which help equalize the probability of bankruptcy among life insurance firms. We do not examine in any depth the success or failure of these constraints to meet their objectives. Instead we investigate the role of information in the market relationships between companies, agents, and consumers.

There do seem to be ways in which, by improving access to information, public policy can benefit consumers without hurting life insurance firms financially. In deciding whether the direct consumer benefits stemming from a change in government regulation exceeds the associated costs, the total effect of the policies on all market participants must be considered, of course, not just the effect on certain interest groups.

On informational issues the government can do two things: it can stimulate consumer search among alternative life insurance policies and competing firms, or it can adopt laws, like those in force in New York, Illinois, and Wisconsin, to limit the expenditures of life insurance agents. The problem with the latter is that the screening and sorting activities of agents (which are essential) are inseparable from their sales efforts. Expense limitation laws, therefore, though reducing excessive selling, also reduce the necessary sorting activity. While firms save on agents' expenses, they lose even more revenue in some segments of the market, which, becoming unprofitable, cease to be serviced.

Leaving aside the issues of over- or underevaluation of policies by consumers, the loss of service resulting from any expense limitation rules means loss of surplus to consumers because the products become unavailable. Either some consumers will not get insurance they otherwise would have obtained or they will purchase less appropriate policies because their choice is restricted.

The alternative is to stimulate more consumer search. Policies which reduce the cost of search by increasing its productivity promote consumer search, reduce the selling effort and expense, lower price variability, and consequently create a more efficient market for life insurance.

The following goals therefore seem desirable:

- to provide better information on types of life insurance policies available to consumers (in other words to simplify the task of deciding which type of policy is most suitable);
- to provide consumers with comparative information on the life insurance companies offering similar policies so that they will have a range of competing suppliers to choose from;
- to lower the cost of selling life insurance so that consumers can buy policies at a lower price without harming the profitability of life insurors;
- to minimize the risk of loss of coverage due to failure of an insuror.

WHY BUY LIFE INSURANCE: INCOME PROTECTION VS BEQUEST

There are two reasons for buying life insurance. One is to protect one's family or business against financial disaster in the event of premature death. The other is to leave an estate to one's beneficiaries. The first can be termed 'income protection,' the second 'bequest.' Most consumers probably purchase life insurance for a combination of the two reasons.

When the insurance settlement is intended to replace lost income, it is intended to repay outstanding debts and to cover costs resulting from the individual's death, such as funeral expenses or the cost of a housekeeper. The death benefit of an insurance policy may be intended to offset either partially or

fully this income loss or expense. To be fully protected, an individual must be insured to a value equal to the present value of the expected flow of future income. The policy-holder may carry less than full coverage depending on the willingness to risk some degree of hardship for any dependents in the event of death. The consumer must trade off lower expenditure on insurance now (i.e. paying a small premium, receiving less coverage, and risking some hardship for any dependents in the event of death) against less hardship for those dependents in the event of death (i.e. paying more to get a larger policy, thereby reducing remaining current income). The desired coverage also depends on the ability of the dependents to compensate for a loss of income. For example, if the household consists of two wage-earners and no children, the partners may feel that little coverage is needed, since each could be self-supporting in the event of the death of the other. Even with children, a couple may feel that less insurance is necessary if the earning power of one is significantly below that of the other.

In the typical situation with a primary income earner in the household, the amount of insurance required to protect against the financial implications of premature death changes greatly through life. When the family is young, with many years before the children can be self-supporting, high coverage is required. As the years pass, the required coverage declines. Insurance needs, therefore, tend to increase while one is young and starting a family but eventually to decrease as the family ages. This cycle is typically accentuated by the fact that the net value of one's estate, itself a form of income protection, normally grows through life as mortgages get paid off and debts are replaced by investments. In recent years the effect of inflation on the coverage provided by nominally valued policies has added a further consideration to planning for income protection.

For income protection, therefore, the most important characteristic of a life insurance policy is flexibility in the level of coverage provided. Term insurance best meets this requirement. Barring medical considerations, a large amount of term coverage can be purchased fairly cheaply early in the cycle when one's need is high and income is low compared to consumption expenditures. In addition, term insurance can be increased (again, barring medical considerations) or reduced as required with no penalty, While 'whole life' insurance (a policy with a savings component and thus a cash surrender value, as distinct from 'term' insurance) does not normally involve an explicit penalty if the policy is cashed in before death, there is an implicit penalty in that the rate of return is significantly lower if the policy is held for only a few years than if it is held for an extended period of time (purchasers usually plan at first to hold a whole life policy until death, or at least past requirement age). Early termination may even result in a negative return being earned on the policy. Conventional opinion in the life insurance industry holds that term insurance should be used to satisfy the

fluctuating need for income protection while whole life coverage should be restricted to a basic level of insurance coverage required throughout life. Unfortunately, as assets whole life policies allow little flexibility. Although they can be borrowed against, the policy-holder can neither forgo the savings portion of the policy for a few years (in order to reduce the premium) nor cash in the accumulated investment and buy back in at a later date if circumstances permit, as can be done with most other investments. Furthermore, if a whole life policy is cashed in early, the return earned is much lower than that expected at time of purchase and based on long retention of the policy.

The bequest motive for purchasing life insurance is quite different. A purchaser may view life insurance as an asset that will add to the net worth of the estate upon death. The goal is not to protect dependents against financial hardship but to maximize the value of the estate left to one's spouse or children. From this perspective, life insurance is not only a part of the consumer's financial planning while the value of the estate is small, but should be an asset throughout life. Such a policy should have a value even if death occurs at an age when term coverage can no longer be purchased. A term policy would be inappropriate since the purchaser may live beyond the renewable age for term insurance, or renewal may become prohibitively expensive. With a whole life policy, the consumer knows that its value can only increase and cannot be outlived.

Despite its apparent advantages, however, a whole life policy is not the only option consistent with maximizing a bequest. Combining a term policy with a non-insurance saving or investment program may, upon examination, prove superior for many consumers. This possibility arises from the essential difference between term and whole life policies.

TERM VERSUS WHOLE LIFE INSURANCE

A term policy is the simplest type of life insurance. Annual payments made throughout the term of the policy entitle the beneficiary to a specified sum of money in the event of the death of the insured person. The premium is based purely on the probability of death during the period of time for which the premium is paid. This can be viewed as a bet between the insuror and the insured, with the insurance company (insuror) betting death will not occur during the year. More formally, the policy consists of a contingent (upon death of the insured) payment for which a premium is paid based on the actuarial probability of death.

Whole life, on the other hand, combines two distinct components: a death benefit and a savings package. Taken from the viewpoint of the payments made

and benefits received, purchasing a whole life policy is equivalent to both purchasing a term policy and setting up a savings program for which there are fixed regular payments. However, it is difficult to separate the insurance and savings benefits over the life of the policy and clearly identify the costs of each.

Since whole life insurance builds up a cash value over time, it is in part an investment; term insurance is not. The cash value of a whole life policy may be borrowed against, or the policy may be terminated and cashed in at any time, but if the investment portion is terminated the death benefit also ends.

Term insurance on the other hand provides no cash return unless the policyholder dies during the term of the policy. Each year is, in effect, a wholly independent policy (or bet).

A whole life policy discourages consumers from seeing as a two-component package. An informed consumer nevertheless views insurance and savings as distinct, though jointly available, products. The uninformed consumer does not think of comparing a whole life policy to the combination of a term insurance policy plus a non-insurance investment package.

It pays insurors to reinforce this misperception because while a death benefit is only available from life insurance companies, investment packages are available from many sources. An informed comparison shopper would compare the value received from a whole life policy to that received from a term policy combined with a savings plan which is independent of any insurance policy, where the contributions to the savings plan equal the year-by-year differences between the whole life and term insurance premiums. If a whole life policy does not stand up to this comparison, it should not be purchased unless some non-financial consideration offsets the inferior return of the whole life policy. Unfortunately, since the rate of return on a whole life policy depends on how long it is held (which is unknown in advance), and the long-run returns of alternative investments are also unknown in advance, this comparison is not simple. The relative performance of the alternative investments will depend on the assumptions made.

GENERAL FINDINGS OF PART ONE

The study in Part One focuses on the structure and conduct of the life insurance industry in relation to the marketing of life insurance policies. Informational issues are particularly relevant. Consumer search is therefore important to the model because it is a primary determinant of knowledge of the alternatives for coverage. Information and search determine the degree of price competition in the life insurance market, which in turn affects both price levels and the cost of providing life insurance.

There is no evidence of monopoly power in either the structure or the conduct of the insurance industry. Profits in the industry appear on average to be competitive. This is in large part a consequence of competitive pressures resulting from the relative ease of entry and exit in the industry. There seem to be no impediments to entry into this industry from scale effects, absolute capital requirements, or product differentiation. Moreover, while the industry supports firms of all sizes, no special advantage accrues to either large or small firms. Nevertheless, although all these conditions must be fulfilled in a competitive industry, in the presence of poorly informed consumers they do not guarantee either a proper selection or pricing of products or an industry that operates with socially desirable marketing efforts. Other problems may still justify intervention by regulators to improve economic efficiency.

In fact different life insurance firms price similar policies differently. These price differences seem to exist because consumers are not all equally able to seek and acquire information about life insurance products. These differences in abilities among consumers lead to differences in the willingness to search.

Classifying consumers by their willingness to search enables agents to offer each type of consumer a price and quality package that will be found minimally acceptable. Younger consumers and women face greater price discrimination than older consumers and men; this fact is shown by the greater price range for policies available to the former, and it indicates two things. First, older consumers and men pay a lower markup over the actuarial cost than younger consumers and women. Second, consumers in the older and male market segments tend, on the evidence, to be better informed about life insurance than those in the younger and female market segments. Groups of consumers who collectively buy life insurance probably face less price and quality discrimination than individuals, because such groups (or at least their representatives) can be expected to be better informed than individual consumers. Greater search is justified for groups since the gains from search are multiplied by the number of individuals covered within the group.

On the other hand some degree of price and quality discrimination by the life insurance industry is probably to be expected. Such price and quality discrimination is made possible by the fact that life insurance agents usually receive extensive personal and financial information on consumers for risk-rating and policy selection. This information helps the agent fulfil two roles. In his role as financial advisor, the agent requires this information to identify the best interests of the consumer. In his role as an agent of an insurance company, this information enables him to differentiate consumers by their knowledge, as well as by their risk, and judge the consumer's elasticity of demand for insurance. The agent can then identify a consumer as a prospect for one of the products

(price-quality packages) offered by his company and determine the most profitable policy that the consumer can be induced to buy. Hence, the information the agent receives for screening and advising purposes also equips him to take advantage of the consumer's ignorance on the insurors behalf. It is in the agent's financial interest to help maximize the profits of the insuror since the insuror's commission is based on sales volume and the type of policy sold (the commission reflects the profitability of the policy sold). Thus it pays agents to use their role as advisers to consumers to influence the evaluation of contract alternatives by consumers through sales effort. To the extent that the agent may induce a consumer to reorder the ranking of contract types in a way that corresponds to the true value of policy alternatives for the consumer, such sales efforts are socially beneficial. But they may also do more harm than good.

Sales efforts may induce consumers to switch their preference to inferior but more profitable policies or to overinsure. From the standpoint of resource efficiency, even if policy choices are unaltered, sales efforts in life insurance are probably excessive if they cause even a modest overpurchase of life insurance. Putting it more formally, sales efforts are termed excessive if consumers on average are thereby induced to purchase more insurance than they would have with perfect information about all life insurance products and producers. This holds true even if consumers initially undervalue insurance. Excessive selling effort also takes place if consumers are induced to purchase a policy with more features (savings, riders, etc.) than they would have with perfect knowledge.

There are no grounds for incentives to concentrate selling effort on a particular type of policies unless it is undervalued in relation to other types of policies by consumers generally. Even if a particular type of policy is generally the best suited to the needs of a group of consumers, an incentive scheme for that policy leads to overselling. The differential commission rates actually offered by most insurors do not seem justified on this basis. To the extent that agents respond to these incentives, any preferential selling effort reflects the profitability of a kind of insurance policy rather than its suitability for the consumer.

To be specific, commission incentives normally favour whole life insurance over term insurance and would only be justified if consumers tended to undervalue whole life insurance compared to term insurance. The relative price dispersion test reported in Table 10 of Part One, however, has shown that not to be the case. Furthermore, measures of the return on the savings portion of whole life policies consistently show that it is well below the return on other market investments. Consumers would thus be better off purchasing pure term insurance and investing the premium saving in a non-insurance investment than purchasing whole life. The agent's incentives therefore encourage him to

recommend against the alternative that would maximize the consumers' expected financial worth.

We turn now to the findings on market structure. First, the industry is characterized by a large number of firms with a significant diversity of sizes. Second, tests for natural monopoly tendencies were negative. Rather, the results indicated non-increasing returns to scale in the production and servicing of life insurance contracts, a situation consistent with, though not explaining, the observed diversity of firm size. The explanation of that diversity rests with the different marketing and sales efforts that life insurance firms must undertake to sustain their operation in their particular segment of the retail market. Large firms with large sales and marketing expenses serve ill-informed consumers who are relatively insensitive to price but feel confident dealing with a firm with a well-established brand name.

The study provides some unexpected findings on the relative value of different types of insurance policies as seen by consumers. As outlined in Chapter 4, an insurance policy has a 'true value' to a consumer which equals the 'true opportunity cost' to the consumer as revealed by a knowledgable insurance expert (if the incentive exists to do so). In a competitive industry this equals the average cost of providing the policy, by definition. Without search, a consumer holds a 'perceived value' of a policy which may be greater or less than the true value since the cost of providing the insurance is in fact unknown to him. Any consumer comparing alternative policies for each competing insuror perceives each to have some absolute net value which equals the perceived value of holding any particular policy minus the purchase price. This absolute net valuation for each candidate policy may be either positive or negative. If the consumer is comparing two policy types, the difference between the absolute valuations of the two can be considered to be a 'relative valuation.' Hence, the relative valuation of two policies indicates how much more or less the perceived value of the first policy exceeds its premium price relative to the excess of the perceived value of the second policy over its premium price.

No empirical measure exists of absolute valuations of policies by consumers; however, relative price dispersions across policies reflect measures of the relative valuations of consumers. The data reveal that consumers of life insurance undervalue participating whole life policies compared to non-participating policies, but surprisingly, in view of what is widely supposed in the industry, they do not undervalue term insurance policies compared to whole life insurance policies. Once again, these results refer only to relative valuations; they say nothing about whether either type of insurance is absolutely overvalued or undervalued.

We can conclude that consumers buy too much non-participating, compared to participating, whole life insurance, but that they do not buy relatively too

much of either whole life or term insurance. Nor can we say whether too much or too little insurance is bought overall.

INFORMATION PROBLEMS IN MARKETS FOR LIFE INSURANCE

Term policies are relatively straightforward and less likely than whole life policies to cause confusion or misunderstanding. However, since consumers choose between term and whole life policies, the information difficulties of the whole life market affect the market for term insurance too.

Several types of such problems frequently occur. For one thing not enough relevant and unbiased information may be conveniently available to consumers at moderate cost. Information is a public good, in that a supplier of information cannot limit its dissemination and its use does not lower its value, so that it is extremely difficult to get everyone to whom it has value to help pay for its production. A potential producer of information who is unable to charge all users cannot extract the full value of making it available. The incentive to produce information is thus much less than is justified based on its total value to consumers. Consequently the information available from independent sources tends to be incomplete, expensive (whereas information from agents though biased, is free), or too complicated for the average consumer to digest. In other words, it is expensive and time-consuming for consumers to become well informed about insurance through independent sources. In contrast, a rich supply of information is available from agents whose incentive is to sell a product. This vested interest is in conflict with the provision of complete and unbiased information. Since unbiased information is a public good, it should be provided through public sources. After all, the provision of public goods (defence, fire protection, etc.) is one of the primary functions of government.

Apart from how much information is available, a separate question is how easily it can be understood. The amount of information available to consumers would not be so crucial if the information already supplied were more understandable and hence more useful. In fact, simply increasing the quantity of even useful information is likely to increase confusion. Life insurance matters seem sufficiently complex that few consumers consider it worthwhile to spend the time to become well informed. Of course it is in the interest of insurors to maintain a complex product so as to increase the productivity of sales effort.

In the purchase of life insurance little consumer learning takes place through experience. With little repeat purchasing, there is minimal opportunity to try different products as is done with toothpaste. It usually takes a long time (often a lifetime) before consumers discover the true value of the products they purchase. Furthermore, because of the front-end loading of premiums with agents'

commissions, it can be very expensive for the consumer to switch policies if additional information makes it seem desirable.

CONSUMER SEARCH

It is generally accepted that consumers do not become well informed about life insurance policies. Thus the productivity of search must be very low; in other words, it is very time-consuming for a consumer to gather information on several companies compared to the amount of money that would be saved. Most purchase decisions are made with virtually no information except that provided by the agent with whom the consumer happens to deal first.

In our model, consumers first choose their desired policy, then formulate their search strategy among competing life insurance firms to discover price and quality packages. (Note that the amount of search engaged in may be nil.) If some amount of search is undertaken by consumers, they seek the company which offers the desired policy at the lowest price and with the best service. Since there is normally a tradeoff between price and quality (of service), consumers compare the price and quality packages offered in the market. The more each consumer searches, the greater is the range of known choice. The more informed the consumer, the more likely he is, for a given price, to purchase the policy of a firm offering higher service (e.g. lower loan rates, better coverage on guaranteed insurability). The price and quality package purchased by the consumer is determined jointly by the consumer's willingness to search and the agent's knowledge of the consumer's search behaviour.

SELLING EFFORT

Poorly informed consumers are more likely to make mistakes. Insufficient information can be expected to result in excessive selling effort since poorly informed consumers do not have much confidence in their opinions. They either know they are poorly informed or can be easily persuaded of their ingorance by a brief display or new information. A diffident consumer is easily swayed. The salesman is strongly motivated to feed selected information to such a consumer. In this situation there is a large payoff to selling effort, and sales efforts will be large (a salesman will continue to invest additional selling time until the opportunity cost of his time just equals the expected increase in income from selling a larger policy or one paying a higher commission). Life insurance companies too, noticing the large marginal payoff to selling effort, will employ a large sales force. As a result, when consumer search, and therefore knowledge, is low, there will be greater selling effort than if consumers were better informed, even if total industry sales are no greater.

Insurance companies can compete either by offering lower prices or by increasing sales efforts, whichever increases sales the most for a given reduction in per-unit profit. It benefits insurance companies to finance additional sales efforts even if the price of their product is forced up by the higher costs, as long as more customers are attracted than the higher price loses. The more confusing the information in the marketplace, the higher the payoff to selling effort and the lower the price elasticity. Hence, the more ignorant are consumers about life insurance products, the greater the expenditure on sales efforts and the higher the price of insurance. That is what happens when consumers have difficulty comparing policies from different companies.

It could pay companies to raise insurance prices and spend the additional revenue on additional selling effort. Such actions are usually self-reinforcing. If the consequence is a lower price elasticity, this would lead to increased sales and therefore increased profits at least in the short run. Prices for the same coverage would be raised. But there are two limiting forces. First, additional sales efforts have diminishing effects on lowering price elasticities. Second, high profits in any sector of the life insurance industry attract other firms and spread consumers more thinly among firms, thus reducing profits. If the extra sales efforts improved consumer awareness, the additional expenditure might improve social welfare. But if consumers were led to overvalue the product, or if simplifying the product would have reduced the need for the additional sales efforts, the additional cost would be inefficient and consumer welfare would be reduced because the extra costs would outweigh the extra benefits.

Selling effort is not a complete waste. Depending on circumstances, there can be too little or too much selling effort. If consumers undervalue a product, not knowing it exists or being unaware of its benefits, selling effort will improve their perception of the product, and they will buy an amount closer to the optimal amount. On the other hand if consumers already overvalue a product, further selling effort will either have no effect or accentuate their overvaluation. Selling effort of this kind reduces social welfare.

Excessive selling effort exacerbates misperception to the benefit of firms and detriment of consumers and results in excessive selling cost. Simplifying information to reduce misperception could lower the price of insurance by reducing the selling effort. However, any alternative to using insuror's agents to inform consumers must be justified on the grounds that the cost to society is less and the quality of information better. The proposals that follow seem to satisfy both criteria.

Much selling effort may be purely competitive, in that companies invest a great deal of money to increase market share rather than improve consumer perceptions of the product. This type of sales effort is of no social value since consumers are no better off, the industry as a whole is no better off (some gain,

some lose), but costly resources have been consumed. If the objective is to informer consumers about a product (in this case life insurance) there may be much cheaper ways to do this than with high-cost competitive selling.

A number of policy proposals will now be presented which are intended to help consumers make better decisions on the type and amount of coverage to purchase, and at the same time to decrease the total cost of informing consumers, including the selling cost of the life insurance companies.

POLICY PROPOSALS

The information problems of the life insurance market can be addressed not by providing more information but by simplifying both the information available and as far as possible the product itself. A great deal of information is already available; to provide more would be as likely to increase confusion as to aid in making the best decision. Further, for this information to combat companies' selling effort it must be easily and inexpensively obtained by the consumer of insurance.

PRODUCT SIMPLIFICATION

In line with improving information to facilitate effective consumer search, it is essential to simplify the selection of products offered by the life insurance industry. There are several ways of doing this while maintaining product flexibility to meet individual needs.

First, standardized names can be established for policy types and riders, as has been done with food items.

Second, policies can be priced on a component basis rather than as packages to simplify comparisons between policy types. This does not require that any prices be changed, but only that the prices associated with the various policy components be disentangled. Specifically, the cost of the death benefit should be separated from the savings component. Guaranteed savings should be separated from participating investment (equity investment, in effect). Finally, the commission fee to the salesman should be stated. Consumers could then make comparisons of the product features they wish to purchase.

Disentangling the components of a whole life policy would not only make it more understandable to consumers but also create an opportunity to increase the flexibility of insurance products. Increased price competition would also encourage the savings component of the package to offer a more competitive return, and it might force insurors to offer more flexible investment components. For example, consumers could be offered the option to skip contributions

to the savings plan or cancel them altogether without having to cancel their insurance coverage.

PUBLIC INFORMATION SERVICE

The information needed should be simple, and it must be easily and inexpensively available. A universal information service, similar to those now provided by the Life Insurance Association and the Consumers' Association of Canada would be desireable. This service should be mandatory and publicly provided to remove the problems of refusal to co-operate and the incompatibility between the insurance needs of the consumer and the profit incentives of insurance agents. It should be mandatory because in order to be comprehensive all companies must be included. A public service would be able to enforce compulsory reporting mandatory and would have a high degree of credibility. The existing information service of the Life Insurance Association, and industry-funded organization, does not make public any information that would facilitate comparisons between firms. The service provided by the Consumers' Association, although firm-specific, is not comprehensive because it relies on voluntarily provided information.

The service should be capable of answering general questions on life insurance (like the Life Insurance Association phone-in service); however, it should also provide at least the following data on specific insurors and policies:

- Types of policies available and the price schedule for each policy type. Instead of providing pricing information through the central information service, it would be reasonable instead to require all companies to provide pricing information over the telephone. This would be less attractive for consumers than having a central information service with specific product prices, but it would be better than the current situation in which it is difficult to get a price without receiving a full sales pitch.
- The historical rate of return on whole life policies compared to the bond rate.
- Historical dividend returns on participating policies.
- A list of all options and riders by standardized definitions along with their prices.
- Retention indices (revenue to the firm minus the actuarial cost of the policy).

An annual or biannual guide should be prepared containing the above information on specific firms' policies and general information on policy characteristics. This life insurance manual should be provided by agents to prospective clients and be available at cost upon request from the public information service.

The funding of the information service cannot be neglected. Since it would be costly, the first issue that arises is whether it would be worth the price. A reliable and credible information service should create many savings. Consumers would save a great deal of search time. Selling effort should be reduced since consumers would have access to basic comparative data without spending a lot of time meeting with agents. With better-informed consumers the selling effort would be less productive and could profitably be reduced. The cost of insurance should decline with the reduction in selling effort, because the increased competitive pressure realized when consumers are better informed should force insurors to pass on the savings. With more thorough consumer search and care in selecting a policy, the lapse rate should be reduced, and consumers would save unnecessary up-front loading charges. Each of these savings will only be realized through the use of an information service that is well publicized, convenient and inexpensive to use, and able to provide current, relevant information.

The next quesiton is who should pay for it. The simplest answer is that it could be provided as a service of the provincial government, perhaps through the office of the superintendent of insurance (after a suitable budget allocation). Alternatively, the funds could be raised through a special, earmarked levy on life insurance policies. In either case, at least a portion of the cost of assembling the statistical information should be recovered by sales of the life insurance guide.

INDEPENDENT AGENCIES

Exclusive agency rules, such as those now in existence across Canada, inevitably inhibit consumer search. Even with easily available comparative information provided by a public information service, many consumers will seek additional explanation, opinion, and highlighting of the policies available and the alternative suppliers. To receive this information for a wide and representative selection of companies from a single source requires independent agents. The consumer will always depend heavily on agents paid to take the time to supply information. The information that an agent will provide, in view of his incentives, should be restricted as little as possible. Exclusive agents have no incentive to provide information on the products of other insurors, unless they are clearly inferior to the products which the agent is selling. Independent agents on the other hand will benefit from providing information on the products of a variety of firms, since they can sell the policies of many different insurors. Independent agents thus tend to increase the productivity of consumer search.

Several jurisdictions in the United States allow independent agents to represent life insurance companies in much the same way as most general insurance

companies are currently represented in Ontario. Allowing life insurance companies to be represented by independent agents in Ontario would improve the lot of both consumers and life insurance agents.

The primary beneficiary of a move to allow independent agents to enter the life insurance market would be the consumer. Under the current system each agent represents only one firm and has no incentive to give consumers information on the policies of other firms. Furthermore, with no standardization of policies, even the information culled from several agents on the policies of their own companies can be difficult or impossible to compare. When consumer search is difficult, not much of it occurs. Insurance firms benefit from reduced search since consumers are less likely to find a lower-priced policy offered by a competitor. And the consumer is less likely to find the company that offers the most appropriate policy at the lowest price.

An independent agent can stock and sell policies from several companies and so give the consumer several quotes at the same time. This can greatly reduce the costs of search and improve its effectiveness. Life insurors will learn to be more sensitive to the competition since firms with lower prices or better service will attract a larger market share.

Unfortunately, allowing independent agents does not by itself guarantee this result. The incentive structure for agents is also important. As long as the information held by consumers does not change, neither does the expected behaviour of the agents. Rather than direct consumers to the most appropriate (cheapest) policies, agents may direct them to the ones offering the best commissions. Consumers may simply have to search among agents rather than among companies. Consequently, the information recommendations discussed above are essential complements to allowing independent agents. If consumers can easily check or verify the information they receive, independent agents will have to represent the best interests of their clients to maximize long-run profits.

Companies benefit from exclusive agency because it allows them to capture the rents of high-performance agents. Since agents are initially undifferentiated and cannot signal their productivity (which even they themselves may not know), they all receive the same package of remuneration from a given firm. Relative productivities are revealed only through performance. Under flexible institutional arrangements, more productive agents should receive rents on their higher skills. However, single-company sponsorship and loss of residual commissions if agents leave to work elsewhere would permit life insurance firms to capture at least some of these skill-specific rents. As a consequence, life insurance firms would be better off and the better agents worse off. But these are only transfers and do not affect resource allocation.

The existence of independent agents, to the extent that they make consumer search easier, will lead to less selling effort and greater price competition, and therefore to lower commission fees. The number of agents in the market will be reduced; only the most productive would survive. Total selling effort and cost would be reduced, and fewer agents would be active, but they would on average earn more because they would capture their skill-specific rents.

Of course allowing independent agents does not force all firms to use them. Experience in the United States has shown that small firms tend to use independent agents since doing so is less costly than running an exclusive agency sales office in an area where sales are not large. But firms that through past investment acquired larger brand names and reputations will find it pays to retain exclusive agents in order to gain a return on their investment in a brand name. If the brand name company's product is sold through independent agents, the advertising and sales effort will draw consumers to agencies where other products are available. The independent agent may then sell the consumer another policy that will cost less because it has not incurred the large advertising expense or that will pay a larger commission out of the saved advertising dollars. Such brand switching is particularly likely to happen in a market such as that for life insurance where consumers cannot easily distinguish quality variations in products and are subject to the sales efforts of agents.

Where independent agents exist, companies sell their products by attracting both consumers and agents. The more influential the agent in the consumer's decision (i.e. the less informed consumers are) the greater the payoff to wooing agents through high commissions or other benefits compared to that of wooing consumers directly through low prices or high quality. Even with independent agents, therefore, improved information must still be made directly available to the consumer. However, if consumers have enough information to keep independent agents from misleading them, a system of independent agency will make it easier for consumers to purchase the best life insurance policy and will improve the bargaining power of agents vis-à-vis the life insurance companies.

COMPENSATION OF AGENTS

The extent to which agents facilitate consumer search depends in large part on the incentive structure under which they operate. Sales agents should be induced to provide consumers with the product and quantity they would choose if they had perfect information about all the life insurance products in the market and all the investment alternatives. The current system of compensation does not reinforce these objectives. Rather the incentive at present is to sell as much as possible, with specific policy types being strongly preferred.

The compensation of agents is currently based on the type and size of policy sold. Basically, firms pay a higher commission to agents per premium dollar for policies which are more profitable per premium dollar. The commission loading on a whole life policy is thus greater than that on a term policy with the same premium. Within each policy type the commission is directly related to the size of the policy.

It is in the best interest of agents to spend their time selling those policies which they expect to return the highest income per hour of selling time. Several factors come into play. Agents favour policies where the commission as a percentage of the premium is higher, policies that are easier (take less time) to sell, policies that on average have a higher premium, and policies that are more likely to lead to further insurance sales. This gives an advantage to any policy that is kept over the long run, locking the consumer into a specific agent or company. It also creates a preference for policies that encourage consumers to augment them with additional coverage.

In many ways the ideal policy to sell, from an agent's perspective, is a whole life policy, where the consumer buys both insurance and savings. A whole life policy usually involves a larger premium than term insurance. (It will definitely involve a larger premium than term insurance for a given level of coverage.) The commission rate on the whole life policy is greater. And a whole life policy is more likely to lead to additional sales for a variety of reasons. First, a consumer is more likely to hold on to the same whole life policy for a long time since the return on the savings portion of his premium rises through the life of the policy. It is generally very costly to cancel a whole life policy with one company in order to initiate one with another insuror: thus whole life policy-holders are less likely to change agents than term policy-holders, since there is no cost to switching companies at any time with term insurance. Since consumers tend to purchase less coverage when buying a whole life policy, because of its higher price for a given level of coverage, it is more likely that they will want to augment a whole life policy with additional term insurance as their income and wealth increase than to augment a term policy (assuming the total insurance coverage required is independent of the type of coverage). Clearly the incentive to agents on an income-maximizing basis is strongly in favour of whole life insurance. This view is supported by the behaviour of agents in the marketplace.

To overcome the product bias either the incentive structure must be changed so that no product is sold preferentially or the commission structure must be revealed so that consumers are aware of the incentives that exist for the agent.

Ideally, agents should be compensated on the basis of eventual consumer satisfaction. Unfortunately this ideal would be prohibitively difficult to implement, so that the agent's reward cannot be based on how well the client is served.

But that does not mean compensation should be based on the contribution to corporate profits, especially since this objective is often directly contrary to the consumers' best interests.

There seems to be no way of legislating a compensation system capable of eliminating all incentive biases for agents. The best approach is thus to inform consumers of the incentives that do exist by requiring all quotes to specify the agent's commission on the sale of a policy.

It does not seem unreasonable or unprofessional to publish the agent's commission. In most other professions, the commission is known to clients. For stockbrokers and real estate agents the commission appears as an explicit charge to the customer known in advance. So too should it be for life insurance.

Revealing agents' commissions would have two effects. First, consumers will be forewarned to be sceptical if an agent pushes one type of policy over another. Second, because a high commission rate on a policy will warn consumers that it may be overpriced, companies will have an incentive to equalize commissions except where they involve different time requirements from the agent. If this is done, the pressure on agents to push certain types of policies will be reduced, and the agent will be encouraged to find the policy that best meets the needs of the consumer.

MINIMUM COOLING-OFF PERIOD

Ontario already has cooling-off laws for many goods sold in the home. Although insurance is not always sold in the home or as the result of an agent-initiated contact, the salesman frequently has a significant impact on the ultimate purchase decision. Furthermore, the lapse rate on whole life policies even in the early years after the policy is sold indicates that a significant number of consumers decide that the policies originally purchased do not suit their needs. This is undoubtedly due in part to changes in the circumstances of consumers, but it also reflects some subsequent dissatisfaction with policy choices when the information provided by the agent is re-evaluated or new information discovered. To protect a consumer from purchasing a policy which later seems inappropriate, whether because he was oversold by the agent or because he simply changes his mind, there should be a mandatory cooling-off period of six months for whole life policies. During this period the consumer should be able to cancel the policy and receive a refund equal to the difference between the whole life premium paid and the cost of a term policy of equal benefit value plus incremental whole life administrative costs (exclusive of agents' commissions). The consumer should also have the option of converting the policy to a term insurance policy of his choice (equal or greater benefit value,

of any type) at any time during the cooling-off period. The conversion to a term policy would be retroactive to the date of purchase, with no penalty for conversion. This implies that the same refund would be provided as for a cancellation except that the refund value would be applied against future term coverage rather than being returned.

The rationale for a cooling-off period is to minimize any tendency for a sales-dependent compensation system to encourage agents to oersell consumers. If a consumer substitutes term insurance for a whole life policy during the cooling-off period, the higher commission for whole life would be reduced to the appropriate level for the term policy.

The effects of having agents in a position to use their superior knowledge to direct consumers can be reduced by strengthening the legal liability of the insurance firms for the advice and information offered by their representatives. Of course it is difficult to monitor the statements of individual agents to consumers in private negotiations. But consumers should be able to obtain information in signed statements, and all agents should be required to present to prospective consumers before making a sale the publicly prepared and funded life insurance guide advocated above.

IMPROVED ACCESS TO GROUP INSURANCE

Group insurance has several economic advantages over individual insurance. Since one policy covers many individuals, a much more thorough search is justified for a group than for an individual. With more complete information, consumer ignorance is unlikely to play a significant role in the decision. Moreover, there is less duplication of effort, since the only duplication is by a few groups rather than by each individual. Perhaps as a result of more thorough search, group contracts tend to be simpler. They are less tailored to the needs of specific individuals, but are likely to cover the common needs. Group policies can, however, permit a fair amount of flexibility for individual needs in terms of total amount of insurance, convertability, and so on.

Another advantage of group insurance is that it allows for rebates based on the actual mortality experience of the group. It should be possible to adapt this approach to individual insurance, which is, in part, the purpose of participating insurance (where consumers participate in the profits of the firm through dividends). When a consumer holds a participating policy and the company has better mortality experience with its 'group' of consumers than expected from the tables used for valuation purposes, or if the investment performance of the company is better than expected, the participating policy-holder should benefit through dividends received over the years. These dividends could be viewed as

basically equivalent to the rebates often received by group policy-holders. There is no reason why companies could not determine their mortality and investment performance relative to the valuation assumptions used in setting premiums and provide annual rebates to all classes of policy-holders. It is not suggested that companies should be required to do this; however, publicly airing the proposal in the more price-competitive environment proposed earlier might lead some companies to make this type of policy available. This approach is the surest way to enable companies to make their valuation assumptions as liberal as possible (after the fact) without endangering the health of the company by being too liberal.

MANDATORY VALUATION RULES

The life insurance market benefited from government regulation of the valuation policies used by insurors to determine premiums to be charged. In 1977 the amendments to Canada's main insurance acts were implemented to remove such regulations and allow company actuaries to set valuation assumptions 'appropriate to the company's experience.' It is not necessary to return to the old system in which the assumptions to be used were numerically set. That system was much too inflexible, which was a major reason for its removal. Instead, some bounds should be placed on the assumptions used, limits that would be tied to economic variables such as the long-term bond rates. This approach would force companies to adjust to major shifts in the economic environment, something that does not seem to happen when such changes favour insurors.

The past record of insurors demonstrates that for valuation purposes they make assumptions that are sometimes excessively liberal and sometimes too conservative. The vast majority, however, err on the side of conservatism. If those assumptions are too liberal, companies will find their premiums or reserves cut to the point that their ability to cover claims becomes eroded, and that could result in bankruptcy.

The more common practice of using excessively conservative valuation rules keeps the cost of insurance higher than necessary. Insurors should thus be required to supply their valuation calculations to the superintendant of insurance so that the assumptions used are available to consumers as part of the information service. Insurors should also be required to use the same mortality tables for calculating both life insurance premium prices and annuity costs. The use of outdated tables would lead to unnecessarily high life insurance premiums, a profitable inaccuracy, but underpriced annuities, an unprofitable proposition. As life expectancy increases, insurors will be forced to update the tables used to calculate insurance premiums so as to avoid losing money on their annuity business; this will force them also to update the tables used for the insurance side of the business.

The discount rates used by life insurance firms for valuation purposes should not be based on the recent rate of return on company investments, as has been suggested by other commentators, because to do so would reduce the industry's incentive to perform well compared to alternative investments. Instead, discount rates should be linked to market rates on long-term bonds.

In conjunction with limitations on valuation assumptions, it is beneficial to limit the accumulation of excessive surpluses. Companies accumulate surpluses for tax reasons and to reduce risk to management, both by giving more flexibility in controlling the profit line in future years and to provide as large a cushion as possible against poor performance and insolvency. This strategy is particularly important in companies that write participating policies, since excessive reserves are achieved by keeping the return to participating policy-holders unnecessarily low. Surpluses themselves would probably not reduce premium levels since the competitive forces which determine premiums are quite independent of retentions for reserves. But eliminating excessive reserves would remove another justification for keeping premiums unnecessarily high and make it easier for competitive pressure to drive premiums down. The *net* premiums are limited by this type of regulation; hence a reduction can be achieved either by reducing premiums or increasing distributions. Limitations on the surplus-to-liability ratio have been implemented in several states in the United States where they have been successful without damaging life insurance companies.

LIFE INSURANCE INSOLVENCY GUARANTY FUND

It is a widely accepted reason for government intervention in the life insurance industry that consumers should be protected from losing their protection through the failure of an insurance firm. The current approach is to use the regulatory environment to minimize the chance of any firm failing. This is done by encouraging the industry to behave in a way that creates a large cushion against financial trouble. However, this cushion leaves room for firms to survive poor management or excessive costs as well as normal economic risks. The consumer is protected, but premium levels may be higher than necessary.

There is another way of protecting the consumer that would not remove management's incentive to trim costs and compete vigorously for the consumers' dollars on the basis of price. The creation of a fund like banking's deposit insurance fund would provide security to individual policy-holders while freeing the regulators to allow more aggressive competition among insurance companies. Although price competition and related investment restrictions would increase the risk of failure of a few companies, the saving to consumers in lower policy prices and higher returns on the savings portion of their policies would outweigh the losses.

The cost of losses would of course be built into the cost of insurance, because contributions to the fund would be costs to the insurance companies. In effect, the proposed system would be a system of required reinsurance where the contingency being insured against would be the failure of the insuror, rather than the usual contingency of the death of the policy-holder.

PUBLIC LIFE INSURANCE FUND

The primary reason for improving the supply of information is to discipline the insurance companies to be as competitive as possible. The better informed consumers are, the harder companies will have to try to win their business. The objective, of course, is to make it as easy as possible for consumers to search among companies since this makes competition more direct. One way of simplifying comparisons between companies is to provide a convenient benchmark. This could be done by establishing a non-subsidized life insurance fund.

However, such an instrument for increasing competition should only be called on if all other less radical weapons prove ineffective. Improving and simplifying information on life insurance policies and companies should be enough to achieve a reasonably efficient market. It would be desirable to test the level of competitiveness, consumer misperception, and sales effort a few years following the introduction of an information service and other competition-stimulating policies. If there is still insufficient competitive pressure to reduce price-quality discrimination and excessive misleading sales effort, as shown by reduced relative price dispersion and other appropriate tests, a non-subsidized public life insurance fund could be considered.

A public life insurance fund could serve as a measuring stick for consumers. If its terms of reference are to provide insurance at the lowest cost compatible with good service and profitable operation, it could offer the socially desirable levels of price, quality, information, and coverage. The problem would be to guarantee that the managers of such a public institution would pursue these objectives.

BEYOND THE INSURANCE INDUSTRY

The problems observed in the life insurance industry are not unique. Imperfect information, for example, is particularly common. The policy proposals put forth here must, however, be considered carefully before applying them to similar problems in other industries because the life insurance industry has several unusual features.

The most tempting industry to transfer the analysis and results to is general insurance. But general insurance is very different from life insurance. If only

term insurance is considered, they are much alike. Each involves an annual payment which entitles the policy-holder to a cash payment in the event of some loss (of property or life, whichever the case may be). The probability of the loss occurring is fairly clear, and the required payment for coverage is easily determined from this probability.

Most of the important problems in the life insurance industry concern whole life policies much more than term insurance. Whole life is a unique product in that payment occurs over an extended period and benefits are received many years after the initial purchase decision is made. Consumers thus find themselves committed to making payments for a product which will not deliver any benefit for many years while both personal and the general economies may be radically changing. Some investment plans may be similar to this, but few are as inflexible. Perhaps the only conclusion applicable to other industries is that in any market which involves infrequent purchase, consumer information is likely to be a problem. It will normally be in the interest of producers to maintain a high level of consumer ignorance, and the information required by consumers is unlikely to be provided because of its public good characteristics. The policies that will most improve the level of consumer information at a cost justified by the ensuing gains to consumers will depend on the situation. Policies that stimulate competition will be the most productive. In most situations where there is a shortage of information, it is appropriate to enlist government intervention in the information delivery process since the market supplies less than the social optimal amount. Furthermore, the information provided is likely to come from producers, who have a vested interest in altering consumer perceptions in a favourable fashion. This point raises the whole question of advertising, which is a major field in itself and beyond the scope of this book.

COMMENTS ON THE PROPOSALS OF OTHER COMMENTATORS

The Select Committee on Company Law of the Ontario Legislature (1980) also saw a need to improve information transfer so that insurance companies would provide an adequate and fair explanation of their products. The Select Committee did not see the need for the superintendent of insurance to give prior approval to policy forms. It was decided that standard definitions of life insurance products should be introduced and that insurance companies should make available more options to change existing policies. Companies should improve disclosure of benefit values at the point of sale, and riders should be standardized and subject to improved disclosure. These recommendations seem sound. But it is also necessary to improve the accessibility of information from neutral sources. Moreover, the Select Committee's recommended twenty-

day cooling-off period seems inadequate. A six-month period would be much more effective.

The Select Committee advised both the removal of restrictions ensuring exclusive agency and the retention of agent sponsorship by firms. It did not see the need for disclosure of agents commissions.

The U.S. Federal Trade Commission (FTC) recommended that rates of return on insurance policies be disclosed, so that consumers can compare whole life policies with other vehicles for saving. To compare different policies the Ontario Select Committee recommended the use of a retention index (premiums minus actuarial costs) as opposed to the interest-adjusted net cost now used in the United States. It also recommended the disclosure of information on products, on policies annually in detail, on summary cost indices, on the cost of protection, and on the rate of return. The FTC too recommended disclosing cost index information and the use of a cooling-off period. The Select Committee saw the need for disclosure at the point of sale, on the date of policy issue, and on a continuing basis. As we have seen, however, disclosure could be handled more simply and effectively.

The FTC found in its report that, among other things, the insurance industry offered low rates of return compared to other investments, and that the cost to consumers of lapses was high mainly because of high withdrawal penalties. The Select Committee saw the need for a better price comparison system including disclosure of basic cost data, widespread availability of cost indicators, and a measure of cost that would allow comparison of dissimilar policies.

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In this penetrating analysis, Professor Mathewson probes four pertinent questions relating to markets for life insurance. He explains the observed variability in the price of alternative life insurance policies by developing a model of consumer choice in life insurance and tests the implications of this model for price levels and price variability. He tests for the presence of natural monopoly elements in the industry, explaining the diversity in the size of life insurance firms and the potential economic advantage of large firms over small. He develops a theory of the role of agents to determine whether there is excessive sales effort in the marketing of insurance. Finally, he contends that there is scope for an expanded government policy on life insurance aside from solvency regulation, and advocates a publicly subsidized information policy to aid consumers in their decisions.

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